Can energy empower women? A case study of the Solar Mamas' programme in rural Rajasthan, India

Giulia M. Mininni

Thesis submitted for the degree of Doctor of Philosophy in Politics

October 2020

Keele University

Abstract

Feminist scholars who have analysed the gender, energy and development (GED) and women's empowerment nexus, including Clancy et al. (2012), Batliwala, (2015), and Dutta et al. (2017), claim that access to energy is critical in the development process for social inclusion and gender equality. However, it is argued that because of societal rules and patriarchal norms that dictate gendered roles and responsibilities, women and children suffer the most from the lack of, and the unequal access to, energy services (Dutta, 2019). This is especially true in the context of rural Rajasthan where there is strong discrimination against women and gender inequality (Kaushik, 2015).

There is a lack of empirical evidence on the extent to which and how, access to energy, and training in energy technology, can facilitate the achievement of rural women's empowerment. This thesis addresses this important research gap through a case study of the Solar Mamas' programme of the Barefoot College (BC) in rural Rajasthan. The NGO has been engaging illiterate and semi-literate women for over 20 years in training in small-scale solar energy technology solutions to address energy poverty. Drawing on feminist constructivist epistemology, I adopt mixed methods of qualitative data gathering and analysis to question the role of the BC in fostering rural Rajasthani women's empowerment.

The specific socio-cultural context of rural Rajasthan makes it especially difficult for those rural women who are marginalised to start their empowerment process alone. Therefore, I argue that the role of the College is critical to facilitating the empowerment of rural women. My analysis reveals that the NGO innovative eco-village cooperative living model offers spatial and temporal features that facilitate long-lasting changes in women's lives, therefore encouraging 'transformative' empowerment. There emerge instances of intergenerational change affecting new generations, therefore emphasising empowerment as an ongoing process. The training and the engagement

with the NGO also encourage women's collective agency and entrepreneurship in the rural energy technology sector. This, in turn, challenges the gendered division of labour and knowledge domains, and contributes to greater gender equality. I suggest that an analysis of the social fabric of households and the community should supplement development interventions on energy provision and energy technology training. Such analysis can uncover social inequalities and differences in energy access, use, and the benefits deriving from services, and can facilitate challenging these constraints to encourage women's 'transformative' empowerment through energy.

Table of contents

List of tables and figures

List of abbreviations and acronyms

AIWC	All India Women's Conference
ARECOP	Asia Regional Cookstove Program
BC	Barefoot College
BPfA	Beijing Platform for Action
CAQDAS	Computer-assisted Qualitative Data Analysis Software
CFL	Compact Fluorescent Lightbulb
CO_2	Carbon Dioxide
CSWI	Committee on the Status of Women in India
DEGR	Department of Energy Government of Rajasthan
DL	Daughter-in-law
EB	Encyclopaedia Britannica
HDI	Human Development Index
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communication Technology
IEA	International Energy Agency
IFWEA	International Federation of Workers' Education Association
IL	In-law
ILO	International Labour Organisation
IPCC	Intergovernmental Panel on Climate Change
IMF	International Monetary Fund
INR	Indian Rupee
IRENA	International Renewable Energy Agency
ITEC	Indian Technical & Economic Cooperation Programme
GED	Gender, Energy and Development
GHG	Greenhouse Gas
GOI	Government of India
GOI-NEP	Government of India's National Energy Policy
LED	Light-Emitting Diode
LPG	Liquefied Petroleum Gas
ML	Mother-in-law
MS	Mahila Samakhya

NAPCC	Indian Government's National Action Plan on Climate Change
NGO	Non-Governmental Organisation
NREGA	National Rural Employment Guarantee Act
NSM	Jawaharlal Nehru National Solar Mission'
NT	New Trainee
MDGs	Millennium Development Goals
PCP	Power Control Panel
PMUY	Pradhan Mantri Ujjwala Yojana
PPP	Public Private Partnership
PRIA	Participatory Research in Asia
PV	Photovoltaic
RET	Renewable Energy Technologies
REW	Rural Electronic Workshop
RREC	Rajasthan Renewable Energy Corporation
SAPs	Structural Adjustment Programmes
SARA	Social Action for Rural Advancement
SCE	Solar Cooker Engineer
SCW	Solar Cooker Worker
SDGs	Sustainable Development Goals
SEWA	Self-Employed Women's Association
SE	Solar Engineer
SE4ALL	Sustainable Energy for All
SHS	Solar Home System
SIDA	Swedish International Development Agency
SM	Solar Mama
SSA	Sub-Sahara Africa
ST	Solar Teacher
STEP	Support to Training-cum-Employment for Women
TERI	The Energy and Research Institute
UCT	University of Cape Town
UO	University of Oslo
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme

UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VAW	Violence Against Women
VEEC	Village Energy and Environment Committee
WB	World Bank
WBG	World Bank Group
WBSCES	Women Barefoot Solar Cooker Engineers Society
WDR	World Development Report
WHO	World Health Organisation

Dedication

I would like to dedicate this thesis to the Solar Mamas for their courage and determination, and to those who accepted to participate in this research for sharing their inspiring stories.

Acknowledgements

I sincerely thank the Keele University School of Humanity and Science Research Institute, the Keele Postgraduate Association, the Athena Swan Fund for Women in Science, the Santander Bank Travel Bursary, the UK-India Education and Research Initiative Fellowship for sponsoring my fieldwork and for supporting divulgating my research at international conferences. I also thank the British Federation for Graduate Women for the grant offered while writing up the thesis.

I am deeply grateful to my supervisor Dr. Sherilyn MacGregor for her support, guidance and encouragement over the years. Huge thanks goes to both Sherilyn and Professor Farzana Shain for their understanding, for providing expert guidance, insight, and for accompanying me through this journey. I am also grateful to Professor Tim Doyle for his guidance and tips as former second supervisor.

I would also like to thank Dr. Stavros Alfionis for sharing his passion for teaching and for making me feel as part of a team. Special thanks goes to all research and support stuff in the Faculty of Humanity and Social Science for their support and dedication.

The period of fieldwork can be challenging; most of all, I would like to express my sincere gratitude to the Barefoot College community for their support, and for sharing their knowledge and wisdom. I also deeply thank them for their availability and for making me feel welcome. I feel privileged to having met ‘Bunker’ Roy for his for his

inspiring work, commitment and dedication to global equality. A special thank goes to Sharmeen, her aunt Mahmooda Kausar, to Sheetal and Sandeep for their kindness in supporting me interpreting some interviewees.

My sincere gratitude goes to the UK-India Education and Research Initiative Fellowship and to the Tata Institute of Social Science in Hyderabad for providing me with constructive feedback on my preliminary findings, and for sharing their time and expertise. I would like to thank especially Professor Lakshmi Lingam for sharing her insights and knowledge of women and gender issues in India, and for her kindness and generosity. My warmest thanks goes to Pooja and her family. I am humbled by their love and kindness and feel deeply happy for having shared so nice moments together.

I would also like to thank Science Po Grenoble Pacte laboratoire for hosting me in these past years, and my friends Gizemnur and the doctorants' crew for being welcoming and ease my transition to Grenoble.

Love and thanks go to my colleagues and friends at Keele, Gulshan, Tania and Catherine for our coffee and French sessions. To my Keele family Eleonora, Fotis, Anna, Tim, and Marina, thanks for spicing up my days. To my Latinas' friends in Grenoble and Jackie, thank you all for your support, love, and encouragement.

Last but not least, I would like to thank my family for their constant love and support, and for always being there. I could never thank enough Austin for being by my side on this rollercoaster and for his unconditional support and love.

Chapter 1. Introduction

1.0 Introduction

Worldwide, one billion people (13% of the world population) live without electricity, and 40% of the global population lacks access to clean cooking fuels, the majority of which live in Sub-Sahara Africa (SSA) and south-East Asia (International Energy Agency et al., 2018). Energy poverty has been defined as "the absence of sufficient choice in accessing adequate, affordable, reliable, high-quality, safe, and environmentally benign energy services to support economic and human development" (Reddy et al., 2000:44). Thus, energy services are not only functional to address basic needs (such as for lighting and cooking), but also for people's personal and professional fulfilment. While energy access is mainly a goal for countries of the global south, where people rely on the use of unsustainable energy sources such as kerosene, cow dung, firewood, and charcoal for the satisfaction of their energy needs, clean energy access is a global concern (Pinter et al., 2013; International Renewable Energy Agency, 2018). However, there is evidence that the extensive use of unsustainable energy services by rich countries is causing changes in the climate patterns that are mostly affecting countries of the global south due to their high dependency on natural resources (Palsson et al., 2013; Pinter et al., 2013; Millner and Dietz, 2015).[1]

Because of gendered roles and responsibilities within the household, which include fetching, shredding and burning unsustainable fuel for cooking, heating and for

[1] Although the North/South geopolitical classification has been criticised in an era of globalisation, I prefer it to the distinction between 'developed' and 'developing' countries, which echoes hegemony, and reflects a unitary economic model of growth (Therien, 1999; Gregory et al, 2011). In this thesis, I refer to the 'global south' to indicate the majority world as mostly non-industrialised, as opposed to the 'global north' which it is "assum[ed being]…developed and 'progressive'[, and that reached a level] of productivity and welfare" (Wieringa, 1994:829; Corbridge, 2009; Jackson, 2009).

the domestic chores, energy poverty particularly affects rural women and constrains their empowerment (Clancy et al., 2012; Pinter et al., 2013; Agarwal, 2018b). Many women are in a position of relative disadvantage because their access to resources such as land, credit and cash is limited in comparison to men (Chant, 2006; 2016; Agarwal, 2018a). There is also a tendency by development interventions on energy technology training and employment of engaging mainly men, thereby discriminating against women (Kooijman-van Dijk and Clancy, 2010; University of Oslo et al., 2019). For example, the University of Oslo et al. (2019) discuss the Alternate Energy promotion Centre (AEPC) micro-hydro project in Mahadevsthan in Nepal; although both men and women were involved in energy technology training, none of the women were engaged in the supply of energy services because of cultural practices and behaviours that constrained their participation. Access to energy is internationally claimed to be essential to achieve gender equality and to contribute to women's empowerment; however, there is often either a lack of gender perspective, or discrepancies between policies and the implementation of projects and programmes at a grassroots level (Danielsen, 2012; IEA et al., 2018).

My research is centred within gender, energy and development (GED) and women's empowerment in development bodies of literature. GED literature focuses on whether access to energy alone, as a material resource, can contribute to the empowerment of rural women, and what other elements are necessary to satisfy their greater strategic needs and interests (Clancy et al., 2004; 2012). The research for this thesis was conducted in Rajasthan, India. The rationale for this choice of location is that there are rural areas of Rajasthan that suffer from the lack of energy services, and which are permeated by social inequality against women in regard to the distribution of resources including energy, food, education, health system, and employment (Laxmi

et al., 2003; Gupta, 2009; Kaushik, 2015).[2] Traditionally, feminist development programmes focusing on energy have engaged rural women in popular education programmes on energy technology training to raise their awareness and increase their expertise (Clancy et al., 2004; 2012; Dutta, 2019). A specifically development oriented Non-Governmental Organisation (NGO), the Barefoot College, is also located in Rajasthan. This NGO has been working on rural development and on women's empowerment through energy training programmes for over 20 years. My case study of the Solar Mamas' programme of the organisation provides three main insights as contributions to women's empowerment and GED fields:

1. the NGO innovative eco-village cooperative living model offers spatial and temporal features to facilitate long-lasting changes in resident women's lives. There are also instances of transformative empowerment affecting new generations (the interviewees' daughters and sons) therefore encouraging their transformative agency;
2. together with the Indian solar programme, the Barefoot College trains rural women from over 93 countries in the global south. The interchange between local and international women who face similar challenges related to their subordination and social inequality, creates solidarity and exposes them to different scenarios. Thus, it raises their awareness and promotes greater change;
3. the training, and the engagement with the NGO encourage women's entrepreneurship in the rural energy technology sector, increasing

[2] There is no agreed definition of 'rural area' globally; however, it is identified as a non-urbanised area, with low population density, and that lacks significant services and infrastructures including energy, education, health and welfare (Javadi et al., 2013).

their self-esteem and autonomy, and equipping them with the skills to compete in the rural energy technology job market.[3] This, in turn, challenges the gendered division of labour and knowledge domains, and contributes to greater gender equality.

Women's empowerment in development literature, which I explore in Chapter 2, claims that empowerment should be started by the people themselves to challenge their subordination (e.g. Batliwala, 2015). However, the remoteness of the rural Rajasthani context, which is shaped by interconnected axes of caste, class, status, and religion, and by a traditional gendered division of roles and responsibilities, makes it particularly challenging for rural women to initiate their empowerment process alone (Kaushik, 2015; Roy, 2015; Agarwal, 2018b). Therefore, as I discuss in Chapter 3, the role of intermediary actors, such as NGOs, is pivotal to facilitating social transformation and promoting greater equality. I adopt interdisciplinary perspectives to understand constraints on women's empowerment and social justice. I combine these with empirically based knowledge on the role of access to energy and of rural energy technology training programmes in facilitating the empowerment of marginalised rural women, to provide a significant contribution to the fields of gender, energy and development, sustainable development, and women's empowerment.[4]

[3] I define the rural energy technology employment market as that offering and facilitating home-based and/or small-scale enterprise to respond to the basic energy needs of the rural poor. Examples of energy-related employment opportunities in rural areas are: phone and battery recharging units, building and distribution of solar lamps, building, maintenance and distribution of Solar Home Systems (SHSs), restoration, hair dressing, refrigeration, and so on.

[4] I define rural energy technology training as capacity building programmes on energy technology that is applied to rural contexts, such as on the building, maintenance and operation of SHSs, solar lamps, and clean energy cooking stoves.

1.1 Gender and Energy in Development

1.1.1 Energy access, climate change and social equality

In the last twenty years, there has been a shift, at an international level, in the perception of the energy crisis, with the recognition of the urgency of addressing it through clean energy access for development (IEA et al., 2018; IRENA, 2018). For instance, while energy access was not included as a global goal in the United Nations' Millennium Development Goals (MDGs, UN, 2015), it was introduced in the United Nations' Sustainable Development Goals (SDGs) that aim to "ensure access to affordable, reliable, sustainable and modern energy for all by 2030" (goal 7, United Nations, 2015; IEA et al., 2018:1).[5] These are 17 international goals set by member states of the United Nations (UN) as part of a broader agenda for sustainable development by 2030, and that saw, for the first time, the establishment of a global partnership for their achievement. Energy access has been recognised internationally as essential for people's human (in terms of their capabilities, knowledge, creativity), social (in regard to their personal and professional networks, rights and obligations), and economic (in relation to their ability to generate a revenue) development (Sen, 1999; 2000; UN, 2011). Therefore, a series of interventions at global and national levels have been initiated to address energy poverty (ibid.). For example, in 2011, the UN Secretary-General Ban Ki-moon launched the Sustainable Energy for All (SE4ALL) initiative that engages governments, the private sector, and civil society. It promotes the single aim of achieving universal access to modern energy services by 2030 (UN, 2012).

[5] Brew-Hammond emphasises that "[t]he term ''modern'' is often introduced in the access discourse to make a distinction between traditional forms of energy like firewood or agricultural residues and commercial forms of energy like electricity or Liquefied Petroleum Gas (LPG). The term "modern" is also used to distinguish between traditional forms of technology like the simple three-stone cooking arrangement and the relatively more knowledge-intensive technologies like the improved firewood stove or the mobile phone" (2010:2292).

There is no one definition of ‘energy access’ that is universally accepted (Practical Action, 2010). Bast et al. write

> ’[a]ccess’ is sometimes measured simply as the provision of a connection to an electricity grid. However, in order to achieve poverty reduction and development goals, the definition of energy access must be broader than an intermittent electricity connection” (2011:4).

On this point, Rao (2013) comments that in India, where my empirical research is based, often, even when there is electricity supply there are numerous power outages that particularly affect the rural areas. As Rao and Baer explain:

> ‘access’ is a far more complex aspect of household energy security than merely having an electricity connection [;] [t]he affordability, availability, and quality of service vary significantly among those who have and receive connections in developing countries (2012 cited in, Rao, 2013:2).

Additionally, a gendered analysis of energy access reveals that although availability, quality and reliability of the connection are important, these are “insufficient in ensuring meaningful energy access for men and women alike, and in ensuring actual utilization of energy services because energy demands are gendered“ (Kooijman et al., 2018:3).

These claims highlight the importance of considering elements other than the physical aspect of energy access. Access to energy is seen not only as access to power as a source of energy (e.g. electricity), but also as access to services that can promote and guarantee people’s wellbeing, the human, social and professional development of otherwise subordinated groups (including marginalised rural women),

address social inequalities, promote education and income generation opportunities. In this thesis, I adopt the definition of energy access agreed by the IEA et al. as "access to affordable, reliable, sustainable and modern energy for all" by 2030 (2018:1). I specifically refer to the access to solar energy for the production of electricity for domestic (lighting) and small-scale income generation purposes, and energy for cooking (in the form of improved solar cookers). I particularly evaluate whether and how access to energy and training in rural energy technology can benefit women and support their empowerment process.

While there are countries that struggle to meet their energy needs, the Intergovernmental Panel on Climate Change (IPCC, 2014) claims that the extensive use of unsustainable energy sources leads to the production of CO_2 emissions that are causing changes in the climate patterns. They stress that climate change is mainly an anthropogenic phenomenon that causes changes in the climate patterns. Global agreements, such as The Paris Climate Agreement of 2015, are calling for a reduction of Greenhouse Gas (GHG) emissions to lower the climate warming below 2 degrees Celsius.[6] These emissions affect the environment, the air quality and people's health, resulting in unpredictable weather changes that are responsible for increased floods, droughts and other extreme climate change-related events that affect poor people's livelihoods, and increase poverty (ibid.). However, these events affect people differently. According to the UN Women report, "[c]limate change has a disproportionate impact on women and children, who are 14 times as likely as men to die during a disaster" (2018:5). Terry writes: "[p]oor women face many gender-specific barriers that limit their ability to cope with and adapt to a changing climate" (2009:5). She suggests that a gender analysis of intrahousehold energy use discloses women's

[6] The Paris Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC), and has been adopted at the 21st Conference of the Parties of the UNFCCC in 2015 (UNFCCC, 2015).

many domestic duties including cooking, cleaning and washing, and their "dependen[cy] on natural resources for their livelihoods" (ibid:7). For instance, the Indian Government's National Action Plan on Climate Change (NAPCC) states:

> [t]he impacts of climate change could prove particularly severe for women. With climate change there would be increasing scarcity of water, reductions in yields of forest biomass, and increased risks to human health with children, women and the elderly in a household becoming the most vulnerable. ...[S]pecial attention should be paid to the aspects of gender'' (2008:14).[7]

Access to energy is internationally claimed as critical for social inclusion and gender equality, this, for instance, is a dedicated goal (SDG, 5) within the UN's SDGs (UN, 2012, 2015). In addition, the UN General Assembly declared the decade 2014-2024 as the decade of Sustainable Energy for All (SE4ALL), and, in particular, the first two years (2014-2016) focused on women, energy and health (TERI, 2014). Thus, there is evidence of the interconnection between global goals on energy access and gender equality. In addition, according to Pinter et al., "[e]nergy, climate change and their relationship are fundamental concerns for sustainable development and their importance is universally recognized" (2013:54). As the IEA et al. (2018) suggest the latter can happen only if the benefits of energy interventions could affect men and women equally and if women's rights could be part of a wider strategy towards social justice and equality. However, there is a lack of empirical evidence on how, and the extent to what, energy service provision can support equality and challenge women's

[7] On this note, Arora-Jonsson comments that, however, "[w]omen, as the particularly vulnerable subjects of climate change, is the only mention made to gender in the Indian Government's National Action Plan on Climate Change (NAPCC)" (2011:744).

subordination. Therefore, understanding diverse everyday energy practices and needs is especially timely in light of global efforts to facilitate energy transition, in terms of providing clean, affordable and reliable energy services for all, and promote social equality.

1.1.2 The women and energy nexus

Approaches to sustainable development through energy access as discussed in GED and sustainable development literature claim that clean, reliable, and affordable energy services can contribute to the human, social and economic development of rural communities (Sen, 1999; Nussbaum, 2000; Clancy et al., 2004; 2012; Escobar, 2011; Pinter et al., 2013). These communities suffer the most due to energy poverty, and are most vulnerable to climate change-related disaster (ibid.).[8] Within them, there are often gender differences in relation to access to and the benefits derived from the use of energy services when available.[9] There is also evidence of social discrimination against women and girls in relation to their engagement in energy technology training, which perpetuates their subordination, and limits their empowerment process (Dutta et al., 2017). However, it is not clear how, and the extent to which access to energy can support challenging inequality and discrimination. My thesis contributes to the fields of gender, energy and development, and women's empowerment in development, by filling these gaps and addressing issues related to social equality and justice.

[8] I refer to sustainable development as the development that ensures the long-term human, social, environmental and economic stability of individuals and communities without compromising the development of future generations. This kind of approach ensures greater social equality and justice of current (intragenerational) and future (intergenerational) generations (adapted from, Brundtland et al., 1987).

[9] I refer to the UN-Energy definition of 'energy services' as those which provide "good quality heating and lighting, modern fuels and electricity" and that "provide mechanical power for agro- processing, refrigeration for clinics, motive power for transport and telecommunications for education and public awareness" (UN Energy, 2005, cited in, Bast et al., 2011:4).

I draw on feminist literature on sustainable rural development, climate change, gender and energy, training in rural energy technology, and women's empowerment in order to understand how access to energy, and to energy technology training, can facilitate the empowerment process of rural women in off grid areas of Rajasthan. There are two bodies of feminist literature that are central to my research: gender, energy and development (GED) and women's empowerment in development. These two fields are interrelated in that GED literature recognises that the empowerment of women is critical to achieving gender equality in energy access, consumption, and in relation to the benefits of energy service. In addition, energy access and training in energy technology can contribute to the empowerment of women, and they are key to attaining social justice and gender equality.

I adopt interdisciplinary perspectives in order to generate knowledge in the fields of gender, energy and women's empowerment in development. Gender, energy and development is an interdisciplinary field that has developed in the past 30 years and that concerns a variety of academic subjects including human geography, feminist political ecology, and social economics. This field emerged in response to the critical need of uncovering and understanding intrahousehold, and broader scale gender dynamics in relation to energy access, its use, and the benefits deriving from it. This is essential to addressing issues of social justice and inequality. In particular, I relate to the work of key feminists in the field of GED (Elizabeth Cecelski, Joy Clancy, Soma Dutta, Annemarije Kooijman-van Dijk, Sheila Oparaocha, Margaret Skutsch and Tanja Winther) who explore different approaches to gender and energy in fields of technology and sustainable development, economics, rural management and governance. Some of these scholars founded ENERGIA in 1996, the International Network on Gender and Sustainable Energy to respond to the global call for social equality in the access to, use of and benefits deriving from energy services, and to encourage the empowerment of rural women through energy development initiatives (ENERGIA, 2018). The network

aim is that “women and men have equal and equitable access to and control over sustainable energy services as an essential human right to development” (ibid.). In relation to literature on women’s empowerment, I mainly refer to the work of feminist scholars such as Nancy Folbre, Kate Young, Naila Kabeer, Srilatha Batliwala and Bina Agarwal (the last three specifically focusing on south Asia and India).

While GED literature centers on how energy access and training programmes on energy technology differ by gender (e.g., for both men and women), my thesis looks exclusively at women’s experience. I agree with Clancy et al. (2012) that analysis of intrahousehold and broader scale gender dynamics in relation to energy (access, use, and the benefits deriving from it) is essential for challenging those dynamics. However, my aim is to understand and evaluate whether access to energy can be a means to bring power (e.g. lighting) to rural women specifically and, at the same time, to explore whether their participation in rural energy technology training programmes can facilitate their ‘em-powerment’ in terms of increasing their socio-political power. Moreover, given the socio-cultural and political context of rural Rajasthan, when analysing women’s experiences it is necessary to treat gender as one of many intersecting axes of difference that shapes their subordination. The caste system, class, status, and religion all influence, in different ways, women’s position and condition in the society. So at the same time as approaching gender in an intersectional way, I am following a long-standing tradition in the feminist development literature of focusing on women’s struggles for empowerment (e.g., Rocheleau et al., 1996; Kabeer and Huq, 2010; Chopra and Müller, 2016).

Kabeer writes about women’s ‘effective’ use of agency that refers to their “greater efficiency in carrying out their given role and responsibilities” and ‘transformative’ forms of agency, which relates to women’s ability to question, challenge and reframe those roles and responsibilities (2003:174). Elaborating on Kabeer’s (2003) conceptualisation of empowerment that I discuss in Chapter 2, I

evaluate the extent to which access to energy and the engagement of rural women in the Solar Mamas' programme of the Barefoot College (BC) contributes to their 'effective' and 'transformative' empowerment. I also investigate whether they contribute to satisfy women's practical, productive and strategic interests and needs. Central to this thesis is the debate in feminist development literature about Molyneux (1985) and Moser and Levy's (1986) practical and strategic gender and women's needs and interests. Their conceptualisation brought new insights into the feminist literature on development, as I further discuss in Chapter 2.

1.2 Thesis aim, objectives and question

The aim of my thesis is to understand the conceptual and practical interrelation between energy access, training in rural energy technology, and women's empowerment. I do this by carrying out a case study of the Solar Mamas' programme of the Barefoot College, which works on rural development and women's empowerment programmes in the global south, and is based in Rajasthan, India. This case study yields important insights into the relationship between popular education on energy technology and the empowerment process of rural Rajasthani women engaged in the Solar Mamas' energy education programme.[10]

My overarching theoretical question is:

'Can energy empower women, and if so, what kind of empowerment can they achieve?'

My empirical research questions are:

'Does the Solar Mamas' energy training programme of the Barefoot College

[10] I explain in more detail about the BC and its solar programme, the Solar Mamas, in section 1.4 and in Chapter 4.

promote the empowerment of women in rural Rajasthan?'

'If so, to what extent, and how?'

'Does access to energy and the engagement in the Solar Mamas' energy training programme contribute to women's practical, productive and strategic gender needs and interests?'

In this thesis, I have:

i. explored current research and theoretical approaches relating to energy access and women's empowerment in the global south and identified gaps between the theory and practice at a grassroots level;

ii. investigated current strategies and practices used by intermediary actors (e.g. NGOs) to facilitate the empowerment of rural women in remote off-grid areas of Rajasthan;

iii. drawn lessons from the analysis of a case study of the Solar Mamas' programme to inform theory and practice in gender, energy and development and women's empowerment in development academic fields;

iv. contributed to the on-going research in gender, energy and development field and proposed recommendations for practitioners on how to address issues of social inequalities (e.g. gender and caste) in relation to energy access and use.

1.3 The rural Rajasthani context: situated case study

In this and the following sections, I outline the research approach and methods I adopted to answer the above questions, and I briefly present an overview of the site location and of the case study. I do this in order to introduce the socio-cultural and geographical context of Rajasthan and to provide a rationale beyond my choice of investigating the Solar Mamas' programme. Taking a feminist constructivist

epistemological approach that focuses on uncovering multiple realities based on the participants' experiences, I use feminist mixed methods of data collection and analysis to conduct a case study of the organisation solar programme. I adopt this research design because it allows me to explore context-specific experiences and circumstances (Yin, 2003), to address my research objectives, and because there is a tradition in feminist research in development of carrying out case studies, as I further discuss in Chapter 4 (e.g., Rocheleau et al., 1996; Kabeer and Huq, 2010; Chopra and Müller, 2016).

Although the Indian Government secures constitutional and legal protection for women, there appears to be inconsistency between policy and practice at a grassroots level and among states (Desai and Temsah, 2014; Rao, 2017). Forms of discrimination against women are especially significant in Rajasthan, and manifest in different customs such as female foeticide and prenatal scans, female infanticide, women's lack of access to property rights, low female literacy rate, the dowry, and female discrimination in the allocation of resources (food, education, and basic needs) (ibid.).[11] Caste plays an important role in the Indian socio-economic structure and affects gender relations intrahousehold and at a broader level (Bidner and Eswaran, 2015; Rao, 2017). Malhotra et al., for instance, discuss that "[i]n rural Rajasthan, for example, the institution of caste controls most of the social and economic activities" (2004:6).

The Indian Constitution promotes discrimination in favour of women, their empowerment and gender equality, and the Ministry of Women and Child Development

[11] For instance, prenatal sex determination has been banned in India since 1994, under the Pre-conception and Prenatal Diagnostic Techniques (Prohibition of Sex Selection) Act, however it is performed illegally (Gupta, 2009; Gangopadhyay, 2010, cited in World Bank, 2012). The Protection of Women from Domestic Violence Act of 2005 encounters opposition by organisations such as 'Save Indian Family'; 'Men against Dowry Act Misuse' organisations contest the Dowry Prohibition Act of 1986 (ibid.). There are instances in which some men feel challenged by changing policies in favour of women's right and wellbeing that can undermine their position and status, and claim customs that are more 'traditional' (ibid.).

also implements a series of policies and programmes on the topic focusing on a coordinated approach to encourage social change and justice (GOI, 2001; Rao, 2017). Nevertheless, Ahmad and Mishra write, "women enjoyed equal status and rights during the ancient and the early Vedic period. However in approximately 500 B.C., the status of women began to decline…" (2016:30). In northern States of India, including Rajasthan, during the Mughal's Raj, starting in 1600, not only Muslim women, but also upper-class Hindu women started performing different forms of *purdah* including self-effacement, covering the face with a veil, and keeping silent in front of men and the elders (Wilkinson-Weber, 1999). The practice of the *purdah* together with that of the *zenana* was introduced by the Islamic invaders (Weitbrecht, 1875; Khan, 1972; ibid.).[12] Yet, Hindus in the south or northeast India do not perform these practices (Agarwal, 1997a; Bidner and Eswaran, 2015). It is evident that intersectional axes such as religion, caste and traditional customs affect women's equality and their empowerment, and that these are particularly strong in the northwest of India, including Rajasthan.

1.3.1 Energy development initiatives in Rajasthan

The geography of Rajasthan offers significant potential for solar energy use at a small or large scale (Agoramoorthy and Hsu, 2009; Rehman et al., 2010; Pandey et al., 2012; Dasgupta and Sankhyayan, 2018). Rajasthan is among the four major renewable energy-producing states in India (together with Tamil Nadu, Maharashtra and Gujarat) (Dasgupta and Sankhyayan, 2018).[13] However, there are areas of rural

[12] The *purdah* or *pardah* means 'screen' or 'veil'. It is a "practice that was inaugurated by Muslims and later adopted by various Hindus especially in northern states of India. It involves the seclusion of women from public observation by means of concealing clothing (including the veil) and by the use of high-walled enclosures, screens, and curtains within the home" (Encyclopaedia Britannica, 2018). The *zenana* is the practice that involves marginalising women to an area of the household (Weitbrecht, 1875; Khan, 1972).

[13] Rajasthan is the largest state of India and it is mostly a desert land (about 60% of its total area). This geographical region has very low rainfall with about 325 sunny days a year

Rajasthan that are energy poor because the electricity grid does not cover some remote villages, perhaps due to the highly dispersed population, and to the cost of the grid expansion (Udayakumar, 2016). In rural areas, energy is mainly used for cooking (with fuelwood, animal dung and crop residues) and for lighting (with kerosene) (Laxmi et al., 2003; Rehman et al., 2010; Pandey et al., 2012; Udayakumar, 2016).[14]

Although the Indian Central Government and the Government of Rajasthan have agreed several energy development initiatives to address both energy and climate change challenges, a gendered analysis of energy access and consumption questions who benefits from Renewable Energy Technology (RET) programmes.[15] Govindan and Palit (2017), claim that the Government of India's National Energy Policy (GOI-NEP, 2017) is gender blind. The policy, although emphasising the interconnection between health issues and drudgery affecting women and children, and the lack of clean energy services, does not include specific objectives on energy use for productive purposes for women, or women's engagement in energy technology

(Agoramoorthy and Hsu, 2009; Rehman et al., 2010; Pandey et al., 2012). The analysis of energy technology solutions goes beyond the scope of my thesis that focuses on the empowerment of rural women through access to energy and training on rural energy technology.

[14] Despite impressive economic growth, the United Nations (UN, 2018) classify India as an emerging economy since there is still a significant proportion of the population with subsistence livelihoods. Eighty percent of the Indian poor live in rural areas and are on the receiving end of aid and development programmes, including the ones intended to improve access to energy (Government of India, 2011; United Nations Development Programme, 2015).

[15] These include, the UN SE4ALL and the SDGs, the Solar Energy Policy (2014), with the aim of installing 25,000 MW of Solar Power Generation capacity at state level through state/private enterprises (Yenneti, 2013; Department of Energy Government of Rajasthan, 2014; Yenneti and Day, 2015). Other initiatives are the Jawaharlal Nehru National Solar Mission (NSM), Public Private Partnership (PPP), and individual efforts (ibid.). In 2016, the Government of India launched the Pradhan Mantri Ujjwala Yojana (PMUY), a three-year energy scheme, which provides Liquefied Petroleum Gas (LPG) to rural households. The scheme is meant to benefit rural women by encouraging their empowerment, improving their health conditions and that of their children (GOI, 2016). However, it appears that although the number of users of LPG has increased, many consumers had to switch back to using fuelwood due to issues of affordability (Bloomfield, 2014). Therefore, better woodland management that ensures the provision of firewood to households in remote areas, or the application of clean energy cooking stoves that can improve the cooking efficiency or by ensuring clean, reliable and affordable energy for everyone, can provide solutions to the energy crisis (IEA et al., 2018). The list of interventions is not exhaustive. The analysis of energy policies and programmes goes beyond the scope of my thesis.

training (ibid.). Reddy and Nathan, for instance, claim, “women are the first and foremost victims of inappropriate fuel choice, method of collection, and inefficient technology adoption” (2013:2).

Yet, there is a lack of empirical data in Rajasthan on how and the extent to which, access to energy services and to technology innovation, could facilitate rural women’s empowerment process and challenge these social inequalities. Several scholars (including Oparaocha and Dutta, 2011; Mohideen, 2012; 2013; Practical Action, 2013; Winther et al., 2018), mention the Solar Mamas’ programme of the Barefoot College as a positive example of development interventions promoting women’s empowerment through energy technology training. Further to this, I offer a deep and holistic picture of the programme, which focuses on both its accomplishments and the challenges that the organisation faces. I do this in order to explore the extent to which rural energy technology training can promote social equality, inclusion, the wellbeing of rural women, and contribute to the achievement of broader development objectives.

1.4 Introduction to the Barefoot College and the Solar Mamas’ programme

The Barefoot College has been working for over 40 years in community development and women’s empowerment.[16] Sunjit ‘Bunker’ Roy founded the NGO in 1972 in Tilonia, in the Ajmer District, inspired by the ‘barefoot doctors’ scheme in rural China in the 1960s that trained rural health workers to provide basic health care for

[16] The organisation and his founder have received a series of global awards as leading organisation in this field. These include, the Stockholm Challenge Award for Information Technology (2002), the Tyler Prize for Environmental Achievement (2004) and the Skoll Award for Social Entrepreneurship (2005). The Schwab Foundation also selected Bunker Roy for Social Entrepreneurship as an Outstanding Social Entrepreneur in 2005 (Roy and Hartigan 2008; Amplifier Strategies, 2016). He is also recipient of the Global Service Award in 2013 (ibid.).

disease prevention.[17] Poor rural villagers built the Barefoot College for the local communities following Gandhi's wisdom and the principles of equality, social justice, and community development (Barefoot College, 2012). One of the NGO's programmes, the Solar Mamas (SM), engages rural illiterate and semi-literate women in training on the building, operation and maintenance of small-scale energy photovoltaic (PV) home systems, solar cookers and solar lanterns.[18]

The College claims that the innovative training model that they adopt is 'transformational' in that it promotes local women's agency, challenges stereotypical top-down educational approaches, and engages women in technology energy training (Barefoot College, 2012). They argue that education, training, and employment in energy technology are usually reserved to men (ibid.). The model has proven to be successful in transferring energy technology skills, enabling it to scale-up internationally in over 93 countries across the global south (Barefoot College, 2015b).

Applying the conceptual framework presented in Chapter 2 allowed me to assess whether, in addition to 'transformational' teaching, the NGO pursues greater 'transformative' change as theorised by feminist scholars (e.g. Kabeer, 2003). From an in-depth and context-specific analysis, which is situated within the particular socio-cultural, political, economic and environmental settings of rural Rajasthan, I gained insights into the women's daily experiences of energy access, energy technology training, and their empowerment process.[19]

[17] Rural farmers in the south of China were often walking barefoot. The Chinese government launched a scheme in the 1960s for health prevention, training members of rural communities as 'barefoot doctors' to reach out remote areas. The name 'barefoot' and originates from the Chinese experience (WHO, 2008).
[18] I discuss my fieldwork in Chapter 4 focusing on the research design and methods.
[19] I discuss the case study selection and provide a more detailed description of the College and of the Solar Mamas' programme in Chapter 4.

1.5 Outline of the thesis

This thesis is structured in eight chapters each of which distinctively contributes to the theoretical debates and practical experience of energy (access and technology training), and women's empowerment in development.

In Chapter 2, I provide a review of important themes in literature on women's empowerment in development and gender, energy and development (GED), in order to identify critical debates, gaps and discrepancies. Critical themes include, women's access to resources, including energy, participation in decision making, freedom of choice, mobility. I elaborate on these themes and on Kabeer's (2003) definition of empowerment to develop a conceptual framework that I use to interpret the findings in Chapters 5 and 6. I suggest that, the specific socio-cultural context of rural Rajasthan, shaped by the intersection of poverty, patriarchal constraints, the *purdah* and religious norms, especially constrains the empowerment of rural women and their access to energy services and training. Therefore, engagement in rural energy technology training programmes is critical to encourage their 'transformative' empowerment.

Chapter 3 reviews literature on and the practice of NGO-based work in the context of India, highlighting the rationale for these kinds of development interventions. Although there is a suite of central and state government policies and programmes focusing on women's empowerment and gender equality, it seems that there are discrepancies between these and the practice at a grassroots level. Thus, identifying these gaps is essential to understand and uncover constraints on women's empowerment. There is a tradition in feminist studies on development of adopting popular education to raise consciousness and transfer skills (Cornwall, 2016). This practice is also evident in GED literature on energy technology training (Clancy et al., 2012). I argue that, although third parties cannot confer empowerment, the distinctive socio-cultural and political characteristics of rural Rajasthan marginalise many women and inhibit their empowerment. Therefore, the work of development-specific

intermediary actors can be fundamental to facilitating women's conscientisation process and agency towards their empowerment.

Chapter 4 presents a thorough account of the empirical research and the epistemological approach that informed my methodology. Adopting a feminist constructivist approach to fieldwork enabled me to listen to women's voices and notice patterns. I chose a case study research design because it allows an in-depth investigation of women's identities, and the equally multifaceted realities shaped by their lived experiences and knowledge. I selected a mixed-methods feminist approach to data collection and analysis in order to create a tight link between the research problem and the research design (Leckenby and Hesse-Bieber, 2007; Hesse-Bieber, 2012:137). I also offer a detailed account the work of the Barefoot College and its Solar Mamas' programme explaining the relevance of this intervention in the rural Rajasthani context.

In Chapters 5 and 6, I present my analysis of the Solar Mamas case study. Chapter 5 focuses on the findings of the interviews with the participants in the solar programme, NGO professionals, and two focus group discussions with local women. The findings highlight that energy access can facilitate the achievement of women's practical and strategic needs and interests and their 'effective' empowerment. However, other elements are required to facilitate gender equality and further 'transformative' empowerment (Clancy et al., 2012; UO, 2019). It emerged that access to light through SHSs is not sufficient to satisfy communities' energy productive needs. The role of the BC has been pivotal in mobilising the solar cookers' programme and addressing wider nutritional needs.

Chapter 6 analyses the findings from the interviews with the participants in the solar programme. This chapter is key to assessing the extent to which the engagement in the solar programme contributes to the participants' 'effective' and 'transformative' empowerment by identifying their achievements and the challenges that they face. It

emerges that the programme differently affected participants according to the role they cover and the level of engagement with the NGO. The eco-village living model of the College is a new approach in gender and energy field, which offers specific spatial and temporal features that especially facilitate the empowerment of those women who live and/or work on campus. The engagement with the NGO has been critical to promote the participants' 'transformative' empowerment, entrepreneurship and employment in the rural energy technology job market.

In Chapter 7, I reflect and elaborate on the main findings and discuss how my research is relevant to, and contributes to the fields of gender, energy and development, and of women's empowerment in development. These findings need to be viewed by the light of the site-specific socio-cultural and political features of rural Rajasthan that constrain women's empowerment. My main argument is that energy access and training in rural energy technology can empower women. The engagement in the SMs' programme facilitates a particular kind of empowerment for the participants. The combination of the training and the campus life particularly encourages the exchange of experiences among women. Empowerment is a process that develops over time; the intersection of the temporality of empowerment with the spatiality offered by the campus are pivotal for the promotion of women's entrepreneurship, their employment and their 'transformative' empowerment.

Chapter 8 situates the main findings and theoretically informed interpretations from the case study within the major debates on climate change, energy poverty, social equality and women's empowerment. I discuss the contribution of my case study to the academic fields of GED and women's empowerment in development. Engagement in training accompanied by the life on campus and the exchange of experiences among women, especially facilitates their 'transformative' empowerment, entrepreneurship and employment in the rural energy technology market. I suggest recommendations

for professionals working in the field and academics. Finally, I identify and discuss what I think are the most significant implications for future research.

Chapter 2. Women's empowerment and energy: a conceptual framework

2.0 Introduction

Scholarly research on gender and energy is situated within wider feminist scholarship on how gender shapes development in the global south, and on the concept of empowerment. For feminist politics, empowerment is a central process by which women act to transform their condition and position in society. Gender paradigms in feminist literature have developed from women in development (WID) approach, to gender and development (GAD) (Jackson and Pearson, 2000; Parpart, 2000; Jaquette, 2017). The shift from WID in 1970s to GAD in 1980s highlighted the recognition of how social and gender relations, and not only gender roles shape, women's condition and position in society (ibid.). However, both approaches have been criticised by some feminist scholars because they address women of the global south as a homogeneous category and as victims of subordination (Jaquette, 1990; Tinker, 1990; Razavi and Miller, 1995).

In the 1980s, the connection between gender, environment and development emerged as a critique to previous approaches that are seen by some scholars as "welfare-oriented and instrumentalist" of women's need and interests (Green et al, 1998; Cecelski, 2004:53). Understanding how social relations outline gender and environmental dynamics is considered as critical in gender, environment and development approaches (e.g. Agarwal, 2018a).[20] Similar concerns are shared by gender, energy and development approach that developed in the early 1990s and that focuses mainly on issues in the global south. Both approaches seek transformational change at a societal and institutional level (Agarwal, 2009; UO et al., 2019). Cecelski (2004) highlights that past research on energy was spread through the literature of

[20] The analysis of these approaches goes beyond the scope of my thesis.

various subjects, for instance, social forestry, environment, health, science and technology. The focus was mainly on women's subsistence activities such as fuel collection and use, and women were seen as passive beneficiaries of energy technology innovations (ibid.). Current GED perspectives (e.g. Dutta, 2019) adopt an approach that sees women as active participants in science and technology, and that highlights how gender inequality in energy access and use, and the benefits deriving from it, hinders the empowerment of rural women and development strategies, goals, planning and policies.

In the first part of this chapter, I review critical concepts from women's empowerment in development and GED literature. I then present a framework that I have elaborated from these conceptualisations, and which I used to interpret the case study of Solar Mamas.

2.1 Feminist critiques of development

Some feminist scholars claim that western views of development, which have been universalised through development programmes, refer to the household as a homogeneous unit and emphasise the role of the man as provider and woman as dependent and carer (Foster and Dale 1986; Tinker, 1990; Young, 1993; Sainsbury, 1999). Up to the 1970s, development policies also considered poor women's needs solely in their traditional roles as mothers and housewives, while technological and financial training were reserved for men (ibid.). There was also a tendency to classify women as a homogeneous category of analysis, "a unified 'powerless' group" (Mohanty et al., 1991:59). This homogenisation implies that women's needs, responsibilities, and interests are identified in terms of their sex (as biological characteristics), and their gender (as related to cultural and social norms) (Jackson, 1996; Young, 1997).

A group of scholars and professionals working in United States (UN) agencies started questioning how western welfare policies would benefit equally all classes, gender groups and races (Parpart et al., 2000). They began to challenge the 'trickle down' assumption, that modernisation would by default increase gender equality, and engaged to influence policy making within the United States Agency for International Development (USAID) (Roseberg, 1990; Parpart, 2000; 2003).[21] Boserup (1970), in particular, explored how development interventions aimed at lifting countries of the global south out of poverty, affected women. She pointed out that many of these projects weakened women's revenue opportunities and engaged mainly men in 'modern' technology knowledge sharing and employment (ibid). For instance, modernisation policies focusing on technology training transfer did not deal with gender inequalities in participation (Jaquette, 1982).

The key failure of the 'trickle down' economic model was the assumption that investment in education and better wages and living conditions to higher classes would benefit all segments of the society (Rathgeber, 1990a). Women were alienated from the analysis due to the belief that improvements in men's life would also automatically benefit them (ibid.). This modernisation model replicated western principles and stereotypes oriented towards economic growth. Activities related to caring, reproduction and survival, mainly exercised by women, were invisible (Goetz, 1988). In addition, in the mid-1970s the World Bank (WB) and the International Monetary Fund (IMF) introduced the Structural Adjustment Programmes (SAPs) that followed their condition-based lending model (Beneria, 1999; Momsen, 2004). Although mainly conceived as an economic instrument, the SAPs had important social consequences such as the reduction of social services and infrastructure (e.g. creches). These

[21] This group of feminist scholars conceptualised the WID framework (Parpart, 2000).

outcomes especially affected women that had to double or triple their workloads to meet their needs, often accepting low-paid and informal jobs (Moser, 1993).

Some feminist scholars argue that mainstream approaches to development tend either to be gender blind or to use women in an instrumental way by pursuing interests at time contrasting women's own (Arnfred, 2001; Fraser, 2013; Grosser and McCarthy, 2018). Rai and Ravi, for instance discuss examples of programmes providing loans for health insurance in India; they comment that "a man is more likely to use the health insurance acquired through his wife's loan than is a woman (through her husband's loan)" (2011:1). Similarly, Batliwala and Dhanraj refer to micro-credit programmes in India to show how 'myths' that depict women as hardworkers, have resulted in their exploitation as trustworthy voters by some government agencies (2004, cited in Cornwall et al, 2007). Microcredit programmes have been broadly criticised for furthering neoliberal economic models that increase social inequalities against women (Khan and Ansari, 2018). Harvey (2003) claims that while a few succeed, the others leave poor women with debts and in a position of dependency (ibid.). These examples show how gender related policies and development programmes originally conceived to look after women and girls' interests and needs, can in practice address other purposes. Batliwala points out that development strategies on gender and women's empowerment are often "apolitical and economistics" because they do not take into consideration structural factors that perpetuate women's subordination, including class, status, religion and gender (2010:112).

There is also a tendency, in international development policies and programmes, of fostering one-dimensional (e.g. economic) empowerment. The World Bank World Development Report (WDR, WB, 2014), for instance, suggests fostering women's economic empowerment as a first approach to increase women's power in the household. Neoliberal economic agendas, such as that embraced by the WB, sees

girls and women in the global south as wealth producers and as key to address global crisis and poverty (WB, 2007; 2008; Fraser, 2013; Grosser and McCarthy, 2018). Therefore, investment in girls specifically, is seen as a “smart economic move” (WB, 2008). However, from a feminist perspective, this seems to be a narrowed approach to empowerment. Feminist theorists of women’s empowerment, such as Kabeer (2001), suggest that increased income is only one of the aspects that could lead to empowerment; other aspects include increased participation in decision making and access to resources. Without challenging asymmetric power relations within the household, financial gains alone cannot translate into women’s empowerment (Kabeer, 2017).

The adoption of a feminist approach when dealing with issues of energy access and programmes on energy technology training uncovers gender inequalities in access and participation in energy technology transfer, and the victimisation of women. The energy technology sector has often seen women as passive beneficiaries and users of programmes rather that “managers and entrepreneurs” (Batliwala and Reddy, 2003:42; Dutta, et al., 2017). Likewise, men have the decision making role within the household in relation to the choice, use and acquisition of energy sources and appliances (Dutta et al., 2017). A shift towards the recognition of women, as energy managers and, of their potential as energy entrepreneurs, entails challenging gender relations and power dynamics (ibid.). To achieve this and understand the differences between the genders there is the need to collect gender disaggregated data on energy needs, access, consumption, management and engagement in the energy technology field (Clancy et al., 2004; Dutta et al., 2017). There is also the need of ‘engendering’ energy policy and programmes (Batliwala and Reddy, 2003) that engage with gender issues in a fragmentary fashion (Dutta et al., 2017). The process of ‘engendering’ “ensures that the different roles, access, and control over resources by women and men are accounted for in project and policy design so that total benefits can be

maximized and gender equality is advanced" (ibid:4).

2.2 Mainstream versus feminist approaches to empowerment

The concept of empowerment, was articulated in the 1980s and 1990s as a grassroots approach to tackle issues of women's inequality and subordination. It was about recognising inequality in power relations and acting upon those to generate large-scale political transformation (Batliwala, 2015; Cornwall, 2016). The word is often used as an 'umbrella concept' in different fields, with the purpose of responding to the need to generate change within asymmetrical power relations (Cornwall and Eade, 2010; Batliwala, 2015). Humphries (1996:36) writes:

> [e]mpowerment in its broadest sense can be seen as increasing power to especially marginalised people and groups, those who are farthest down in the ladder in the power over hierarchy and who have least access to knowledge, decisions, networks and resources.

Batliwala (2010) claims that the concept was introduced in the 1995 Fourth World Conference on Women in Beijing. Signatories of the Beijing Declaration committed to 'enhancing further the advancement and empowerment of women all over the world…' (UN, 1995:2, cited in Batliwala, 2010:113).[22] The empowerment approach infers that social, cultural, economic and political transformation is essential to eradicate gender inequality and other constraints (Moser, 1993). In addition, it aims at addressing both

[22] The Conference also launched the 'gender mainstreaming' strategy, for which, women's and gender issues are meant to be integrated in all policies and programmes, modifying also institutional and organisational procedures to succeed (Moser, 2005). However, although adopted at policy level, there is evidence of gaps in its implementation at the grassroots (ibid.).

women's practical and strategic interests in order to achieve greater 'transformation' (Kabeer, 2003), as I explore later on in this chapter.

However, mainstream development institutions have appropriated the concept to foster neoliberal agendas (Cornwall and Anyidoho, 2010; Chant, 2016). Empowerment has been voided of its original scope and political edge of mobilising women's collective agency to challenge social, economic and political relations. It is used in an instrumentalising and individualistic manner to pursue neoliberal ideals, such as that investing in women and girls would be a win-win strategy to challenge patriarchy (ibid.).[23] For instance, international agencies, including the World Bank, often instrumentalise gender equality and the empowerment of subordinated girls and women because of their potential to raise the local economies, as discussed in the previous section (WB, 2012). The WDR states, "[…] gender equality matters instrumentally, because greater gender equality contributes to economic efficiency and the achievement of other key development outcomes" (2012:3).

There are instances in which development initiatives have appropriated the concept and used it as a catchword either as a synonym of women's development and participation or in a patronising way to pursue interests at times conflicting with those of the affected groups (Chant, 2016).[24] This shift also means focusing on instrumental gains by solely increasing women's access to resources, rather than on women's

[23] Similarly, there have been attempts to 'mainstream' empowerment in global north (De Blasio and Sorice, 2018).

[24] I find critical to point out how, although used in development, the term 'empowerment' does not easily or equally translate in other languages of countries in the global south, therefore undermining the transnational application of the term (Luttrell et al., 2007). For instance, in Spanish the word *empoderar* is considered ambiguous and obsolete; in French, 'empowerment' translates into authorise or enabling, therefore emphasising 'power over' and 'power to' (ibid.). In Hindi, the term 'sashaktikaran' is not used informally or in a colloquial way, but it is rather used by the government and NGOs when referring to the empowerment of marginalised groups (Groff, 2017). Other terms used in the common language are 'aage barhna' or 'to move forward' and 'aage bahaana' or 'to cause to move forward' (ibid.). I explain my fieldwork experience in translating 'empowerment' in Chapter 4, section 4.1.2 when I discuss the study challenges.

social and professional development and on challenging the structural basis of women's subordination (Corwall, 2016).

Feminist approaches to empowerment embrace women's 'power with' and the 'power within' to generate change through acquired self-confidence and agency (Clancy et al., 2012; Corwall, 2016).[25] The work of feminist scholars such as Srilatha Batliwala, Bina Agarwal, Naila Kabeer, and Gita Sen is particularly relevant in analysing and framing the concept in the context of India. Agarwal points out that "women cannot be posited as a unitary category, even within a country" since this would otherwise disregard "forms of domination other than gender" (1992:122). In the context of India, there are significant discrepancies in regards to women's marginalisation and their empowerment process between States (Rammohan and Vu, 2018). For instance, populist parties have co-opted the concept of empowerment for its transformative potential and constrained it into "politically manageable" spheres such as the Self-Help Groups (SHGs), and within the local political system through the reservation quota for women in local government's (*Panchayat*) seats (Batliwala, 2010:117; 2015).[26] However, it is not clear whether these have produced any long-term changes to women's oppression and marginalisation (Batliwala, 2015). The Hindu nationalist politics portray the Hindu woman as empowered, educated and equal while reinforcing women's disempowerment and their subordination with regional practices such as female foeticide and the dowry (ibid.).

The existence of customs that reinforce women's subordination in the family and communities requires extending the analysis of power relations within the family and community in order to advance the process of empowerment (Batliwala, 2015). Race, history, class, caste and position in the economic order, also affect how women

[25] I discuss the concepts of 'power with' and 'power within' in the next sections.
[26] The *Panchayat* is "an elective village council of about five members organised […] as an organ of village self-government" (Merriam-Webster, 2019).

perceive oppression (ibid.). In this regard, empowerment is not a zero-sum game, although there may be winners and losers, but a concept that goes beyond participation, though of course this is essential (Sen, 1997). In Rowlands' eyes, "empowerment is more than participation in decision-making; it must also include the processes that lead people to perceive themselves as able and entitled to make decisions" (1997:14). In this frame, the concept envisages women's access and control over material (physical, human or financial, including water, food, land, body, money), intellectual (knowledge, information, ideas, creativity); and ideological resources (facilities to generate, diffuse, sustain and institutionalise beliefs, values, attitudes and behaviours), as well as networks (family, community, the market, other institutions) (Batliwala, 1994a). Access to resources, as indicated above, and knowledge (and the recognition and valorisation of experiential knowledge) presumes also increased self-esteem, education, information, independence and rights, and hence, power.[27] It appears that empowerment politics aim to encourage social groups (e.g. women's groups) to define their interests and needs and to mobilise towards achieving them. It is, thus, an approach that envisages a transformation from below or 'bottom-up' through women's mobilisation around their practical and strategic interests (Batliwala, 2015).

2.3 Women/gender and energy

The purpose of this section is to situate the gender, energy and development approach within wider feminist frameworks on energy in development. Cecelski claims that the link between women/gender and energy emerged as critical for connecting energy to other development goals including on women's health, education and

[27] I am emphasising here that often knowledge is measured using western parameters and that women's knowledge at a grassroots level (contextualised locally, culturally and historically), should have the same value and recognition. I carry forth a discussion on science and knowledge in the following chapter.

employment (2004). The ‘energy community’ discussed the majority of past research on gender and energy and addressed energy issues and approaches (ibid.). In the global south, the focus was mostly on ‘traditional fuels’, with biomass being the main fuel source (Cecelski et.al. 1979; Barnett, 1982). Energy research brought attention to women’s roles in the energy sector highlighting that mainly women and children were involved in unpaid fuel collection. The study of biomass energy uncovered women’s roles within the energy field (Cecelski, 2004).

Feminists interested in uncovering and understanding women’s daily energy practices and implications applied the women in development (WID) framework focusing initially on the gender division of labour (Peskin and Barnes, 1992, cited in Cecelski, 2004). However, women were depicted as a homogeneus category, as victims of subordination (ibid.). Cecelski (2004) discusses that the attention was on women only rather than on social and gender relations and energy practices, and that an analysis of differences among women based on their age, class, ethnicity and income, was lacking. Seeking to address gaps in previous conceptualisations of social relations of gender and their connections with environmental change, some feminists adopted the gender, environment and development framework to explore its “application to gender and energy analysis” (Green et al, 1998; Jackson and Pearson, 1998; Cecelski, 2004:53). In line with the environment field, women have multiple energy interests that depend on their status, class, and so on, and both gender roles and relations at micro and macro levels are critical in the analysis of gender and energy (ibid). GED consolidated as a framework to explore the connections between gender and energy, whether gender plays a role in energy interventions, and whether increased energy access can contribute to women/gender empowerment (Cecelski, 2004).

Feminist scholars focusing on energy access and development (e.g. Dutta et al., 2017) argue that due to the intersection of poverty, subordination and patriarchal

norms, rural women are often marginalised within the domestic sphere. Patriarchal norms and customs derive from these asymmetric power relations and dictate gendered roles and responsibilities in the society. Molyneux writes:

> [t]here are differing definitions of patriarchy, but most of them agree that it describes a power relation existing between the sexes, exercised by men over women and institutionalised within various social relations and practices, including law, family and education" (1985:253).

Perhaps due to these customs, many women in rural areas are in charge of chores including cleaning, cooking and the procurement of fuel for the household's energy needs; this involves, at times, walking long distances and carrying heavy logs, with detrimental consequences for their health (Clancy et al., 2002; 2012; Winther et al., 2018). The World Health Organisation (WHO, 2006) reports that exposure to fumes deriving from the combustion of unsustainable energy sources severely affects women's lungs and respiratory system with frequent cases of asthma and pulmonary diseases. Worldwide, in 2012, six out of 10 deaths due to indoor air pollution were women and girls. While there have been notable gains in the use of Renewable Energy Technologies (RETs) for electricity, clean cooking fuels and technologies are lingering behind with adverse consequences for the majority of the world population in terms of the climate, environment, health and social impact (IEA et al., 2018).

Traditional customs also influence women's intake of food; in most of the global south women have secondary claims on food (e.g. they eat less and last) (Batra and Reio, 2016; Aurino, 2017; Agarwal, 2018b). In situations in which they are allowed outside the household, rural women are often engaged in agricultural or infrastructural work (Sharma and Badodiya, 2016; Agarwal, 2018b). However, due to the gendered division of labour, roles and responsibilities, and because of cultural prejudice against

women, they perform backbreaking tasks (including manual threshing and husking, transporting heavy material by foot, and so on) without the support of energy technology facilities (ibid.). Therefore, access to sustainable energy services can be especially suited to address energy poverty issues in rural areas (Bhattacharyya and Palit, 2016). Perhaps, RETs are best suited to address these issues since they promptly respond to the energy crises in rural off grid areas (Cecelski, 2004).

It is often the case that women's work is invisible and undervalued in patriarchal societies (Reddy et al., 2000; Ladusingh, 2016). In India, although women are responsible for activities fundamental for the survival of their household (including caring for the elders and the children, cooking, cleaning, and procuring energy and water), their skills, the time spent performing these tasks, and their work are not recognised and are taken for granted (Kantor 2003; Ladusingh, 2016). The lack of energy provision also especially affects their safety and mobility. There are reported cases of women's harassment happening when accessing toilet facilities after dark or while collecting fuel (Panjwani and Cecelski, 2003; Kulkarni et al., 2017). Street lighting and lanterns are needed to facilitate women's mobility and increase their safety after dusk, as Clancy et al. (2012) suggest. Availability of, and access to energy services also ease women's drudgery and free their time (ibid.). The importance of exploring the nexus between access to energy and energy technology training, and women's empowerment, emerges from the limited, although growing, empirical evidence on this topic and from the recognised persistence in energy programmes and policy of social inequality affecting women.

2.4 Constraints on women's empowerment

Many feminist authors are concerned with key questions such as: to what extent are women aware of and accept social and institutional restrictions? What are the challenges for women's empowerment (for instance, Whitehead, 1984; Kandiyoti,

1988; Fierlback, 1995; Chant, 2016; Cornwall, 2016)? There are contrasting perspectives in regards to women's condition and position in rural societies of the global south and to their perception of legitimacy. It is disputed whether women 'adapt' to the reality they are confronted with, and hence, passively accept it; or, whether women's compliance is a strategy to guarantee their self-interests. Three main considerations arise: first, some rural women might be unaware of social and institutional constraints on their equality and freedom; second, women's passive acceptance could due to their perception of what they are or are not allowed to do; third, women's adaptation to their subordination could a strategy for their survival.

On the first point, Malhotra et al. (2002), suggests that since inequalities often operate subtly, many women might be unaware that their socio-cultural context influences their condition of subordination. Since alternatives are not always evident, women often accept living in a subordinate way. In addition, because their interests are entrenched with that of other family members, some women find it difficult to discern whose interests they pursue (ibid.). Sen's (1999) cooperative model of intra-household bargaining indicates that, in their roles as mothers and wives, a false perception of others' interests as their own limits women's agency to advance their own interests. Some studies in northwest India show that women prioritise the wellbeing of their family and children, while men allocate resources for their personal interests (Jeffery, 2018; Patel, 2018). In addition, women's alienation from resources such as land, the cash economy, financial instruments, markets, the marketplace itself, and from the related production technology further sustains gender inequalities and constrains their empowerment (ibid.).[28] In relation to energy specifically, the lack of financial support for women, for example in the form of credit and loans, make it

[28] In regards to female land ownership and inheritance customs, there are differences between Muslim and Hindus' traditions. For a detailed analysis, see Kabeer (1999a; 1999b; 2001).

particularly difficult to access and/or purchase small-scale clean energy technology. The initial cost of small sale RETs (e.g. solar PV home systems) often puts off investment by the rural poor (Danielsen, 2012). GED literature argues that even when clean and reliable energy options are available to rural women, there are instances in which they resist using them if it implies challenging customs; for example, due to cooking customs they might be reluctant to adopt solar cookers (Kooijman et al., 2018).

On the second point, women's passive acceptance could be due to their perception of legitimacy. Several feminist authors highlight that marginalised women in the global south, influenced by cultural norms and customs, might internalise their condition of people of less value within their family and community and believe their oppression is the norm (Kabeer, 2001; 2017). Consequently, it might be difficult to evaluate women's choices and actions without recognising and accepting that these might not benefit women as individuals, when and if, women's notion of personal interests is constrained by cultural assumptions (Fierlbeck, 1995). This internalisation constrains their self-confidence and self-esteem; this is a critical theme in literature on women's empowerment in development.[29] It seems that women's perception of legitimacy of what social conventions allow or not is contextualised in time and space, and influences their behaviour. Hence, because of their vulnerability, rural women might be reluctant to change. These considerations are true not only in regards to gender inequalities but can expand to other socio-cultural restrictions that women face including caste, age, and religion. How can women challenge these values in order to bring greater change in their life? What tools are available to rural women to foster their empowerment? As Batliwala (2015) suggests, liberation starts from the recognition of problems and social constraints, and then to fashion an alternative. She points out that while material needs such as food, accommodation, water, and so on

[29] I discuss this point further in section 2.5.3.

“have to be met, they cannot be an end in themselves”; it is essential for women also to fulfil their strategic interests, such as income generation, education, and so on (2015:48). However, because of their internalisation as people of less value and in light of their position as oppressed, marginalised women might be unable, by themselves, to challenge external constraints.

On the third point, women’s acceptance of their subordination could be a strategy for their survival. Sometimes, rural women act in a certain way because their immediate material interests are at stake; they choose not to choose. Some authors suggest that this freedom does not have to be confused with ‘false consciousness’ or with “adapted perceptions” of reality (Sen, 1990:126; Agarwal, 1997b; Kabeer, 1999b). Thus, the denial of choice shapes this kind of behaviour and reinforces women’s subordinate status (Kabeer, 1999b). In line with this argument, Jónasdóttir (1988), Kandiyoti (1988) and Fierlbeck (1995) highlight how, if some choices are not allowed or have severe consequences, women's failure to make the ‘right' choices is not due to unawareness or to unconscious bias. In this case, women's choice is a conscious choice, it is dictated by the fear of putting at stake their safety, and of the people they care about. For instance, although they might be aware of the negative consequences of secondary claims on food for their health, they will not oppose this practice if they are afraid of violence against them by their husband (Kabeer, 1999b). Concerning energy, Clancy et al. (2012) recognises that, for instance, some women might refuse the adoption of clean energy solution (e.g. clean cookstoves) because the local community might see them as lazy.

Similarly, Sen (1987) comments that it is not only about being concerned with one's own or other people's well-being since there might be other objectives that a person might be willing to pursue. As such, sometimes, even when there is the opportunity to challenge patriarchy and other constraints, women might respectably manifest passive resistance (Kandiyoti, 1988). Kandiyoti states, “[w]omen strategize

within a set of concrete constraints, which I identify as 'patriarchal bargains'" (1988:274). It appears that in certain contexts or circumstances women might take advantage of their subordinate position and adopt strategies that can increase security and improve life options (Kandiyoti, 1988, Sharp et al., 2003). Sharp et al. suggest that, "[w]omen who adopt this strategy are therefore reluctant to engage in activities that may challenge their gendered bargain" (2003:281). On this point, Folbre (1994) claims these strategies might be the result of 'allegiances' and shared behaviours between women to overcome oppression. Kandiyoti (1988) also specifies that the exercise of 'patriarchal bargains' might vary according to the status, class, ethnicity and caste; these impact women's passive or active roles as agents of change in relation to their oppression. She gives the example of women working outside their household: although they might have gained some form of freedom by spending time outside their house, they feel 'exposed'; therefore, they might protect themselves by wearing the veil.[30] Women's identities involve a continuous process of internal negotiation that is unique to a woman's own perception and struggle. Hence, when it is too risky to bargain, a woman has to compromise.

Among the constraints on women's empowerment, Agarwal refers to a "gender ideology" against women (1997a:43). This ideology dictates what can or cannot be considered acceptable and appropriate in terms of women's behaviour (deference to the male elders, the stress on soft speech), their role, their presence in spaces where men congregate and other public places, and their capabilities (ibid.). Religious customs also play a role in emphasising gender inequalities with some variations in India, for instance, between Muslims and Hindus (e.g. in regards to the practice of veiling) (ibid.). In India, there are significant differences among regions and communities (tribal/nontribal, Muslims/Hindus, upper/lower caste Hindus, etc.)

[30] In some rural Indian areas, women are not allowed to work outside the household.

concerning female segregation (Desai and Temsah, 2014). As noted in the Introduction, states in the northwest, including Rajasthan, are particularly challenging for women since multiple constraints of caste, class, status, age, religion, and gender hinder social equality and women's empowerment (Gupta, 2009; Kaushik, 2015). Therefore, women's awareness needs to expand to enable them to make choices beyond what is expected, normal or possible to do (Fierlbeck, 1995). Formal and informal educational programmes, like the Solar Mamas', and the exposure to different ways of 'being and doing' can illuminate women's consciousness on alternative scenarios. Agarwal (1997a) shows that women's groups and grassroots initiatives have mainly developed among tribal or hill communities where women live with fewer limitations in terms of their participation in the public arena. On this point, Gull and Shafi (2014) discuss a few examples of women's movements that started in India, all of which affected tribal and rural communities: the Chipko movement in Utthar Pradesh, the Shahada and anti-price rise agitations in Maharashtra, and the Self-Employed Women's Association (SEWA) (Kumar, 1993 cited in). These examples indicate that where women live with less socio-cultural pressure, they can be the protagonists of their own liberation and empowerment process. It is the case then to understand how and what can support rural women's empowerment when, due to their alienation, they might not be able to start their own conscientisation process and strategise an alternative to their marginalisation. Although empowerment cannot be granted to someone (as claimed by, for instance, Mosedale, 2003 and Batliwala, 2015), there are instances in which women are so oppressed that self-empowerment is impossible and therefore needs to be enabled or catalysed by third parties. My research, based at the Barefoot College, especially explores the role of intermediary actors (e.g. NGOs) in facilitating the empowerment process of rural women.

2.5 Conceptual framework: women's empowerment and energy

I adopt a feminist perspective on development debates and politics related to the access to, control of, use of energy, and women's empowerment by drawing on the critique of traditional male dominated knowledge production; this is inclined towards ignoring the perspectives and daily-life experiences of marginalised women (Harding, 1991; Kabeer, 2012). My conceptual framework is specifically tailored to gain an understanding of how access to energy and training in rural energy technology contributes to women's empowerment in the context of rural development (see Fig. 1). I bring together Kabeer's (2001) conceptualisation of women's empowerment dimensions to measure empowerment, her (2003) theorisation of 'effective' and 'transformative' agency, and Clancy et al.'s (2012) identification of an energy dimension of practical, productive and strategic gender interests and needs. Women's 'effective' and 'transformative' agency can facilitate their 'effective' and 'transformative' empowerment. This distinction builds on Moser and Levy's (1986) conceptualisation of practical and strategic gender interests and needs; a dichotomy that has been recognised as significant in gender and development literature. Drawing on the theories of women's empowerment, energy access and education in energy technology, I also identify key recurring themes that I apply to help me interpret the findings of the case study presented in Chapters 5 and 6, as I discuss in section 2.5.2.

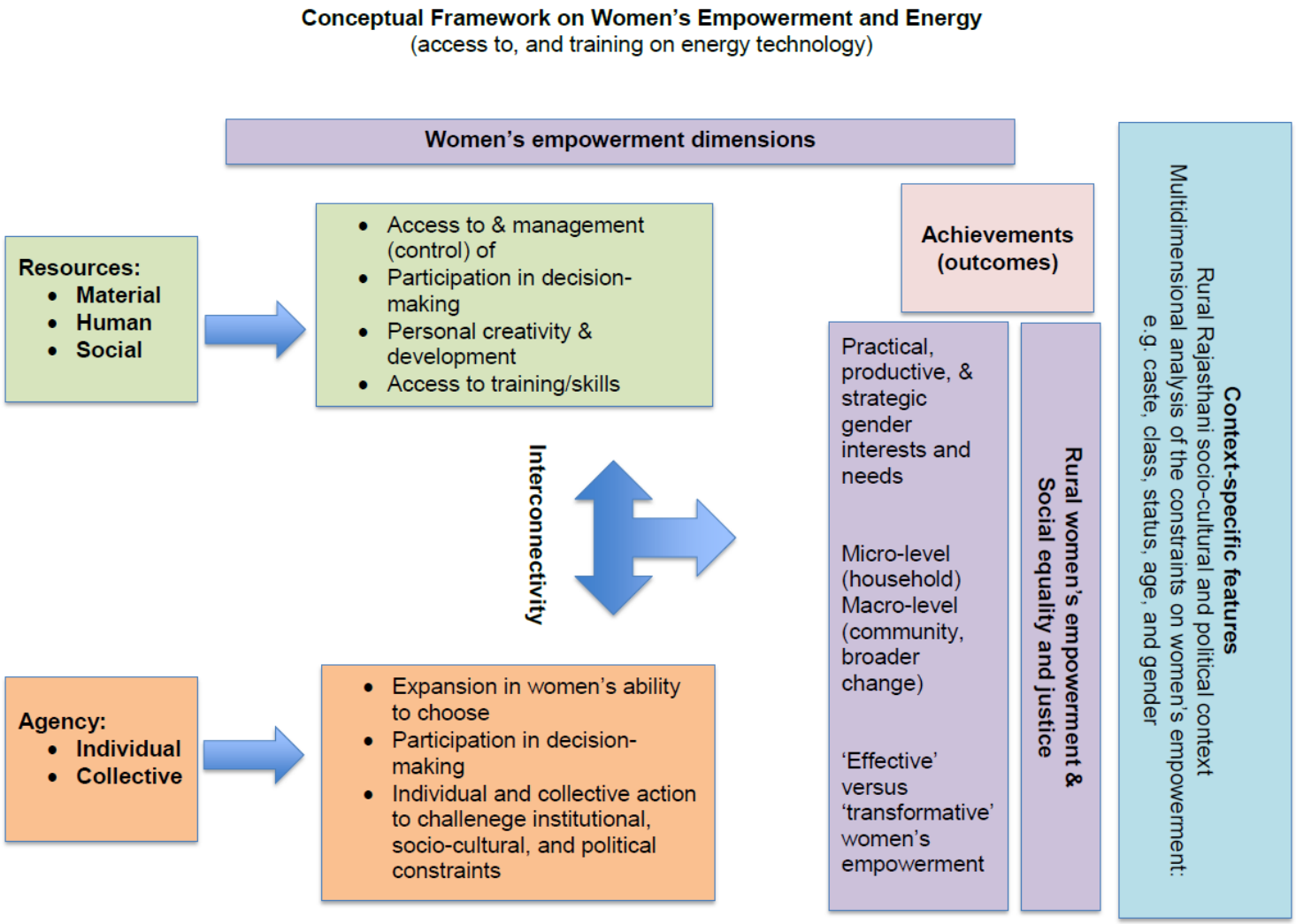

Fig 1. Conceptual Framework on Women's Empowerment and Energy

2.5.1 Kabeer's definition of women's empowerment

Although in feminist and development literature, there are over thirty-two definitions of women's empowerment that highlight different aspects of power, most of them recognise the two distinguishing elements of agency and process (Kabeer, 1999; Sen and Batliwala, 2000; Malhotra et al., 2002; Malholtra and Schuler, 2005; Ibrahim and Alkire, 2007).[31] I elaborate on the definition adopted by Kabeer because she recognises that empowerment is strongly intertwined with access to resources and to the "ability to make choices" in life: "[o]ne way of thinking about power is in terms of the ability to make choices" (2001:18). While Kabeer does not refer to energy specifically in connection to empowerment, I complement her analysis by contributing new insights on the links between energy and women's empowerment, by exploring whether and how access to energy and training in rural energy technology can contribute to the empowerment of marginalised women. In the above quote, Kabeer (2001; 2005) highlights the importance of people being able to define their own interests and having the capacity to choose. This implies that people experience disempowerment when they are not able to achieve their desired interests and goals due to external constraints (ibid.). The ability to choose also suggests that there are alternatives to what has been chosen, or that it is possible to choose otherwise (ibid.). However, poverty and disempowerment might be linked because often the requirements of survival may involve the complete absence of alternative choices (ibid.). This might be even more accurate in regards to women than men might since gender-related inequalities might reinforce poverty (ibid.). Kabeer also writes:

> [e]mpowerment thus refers to the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to

[31] I discuss 'agency' in section 2.5.2.2 and 'process' later in this section.

> them [,and thus,] [e]mpowerment entails a change in the terms on which resources are acquired as much as an increase in access to resources (2001:19-20).

While analysing this definition, I split it in three sub-sections in order to gain a better insight into the various aspects. Section one discusses the 'expansion in people's ability to choose; section two, focuses on the 'contextuality of choices'; and section three on 'challenging structures of constraints'.

Expansion in people's ability to choose

In the first part, "[e]mpowerment thus refers to the expansion in people's ability to make strategic life choices", the word 'expansion' entails dynamism, a process of change from previous conditions. This process is not neutral, but aims at fostering the interests of women to achieve economic, social and political change (2000:19-20; 2005). Thus, empowerment is not an end state but is both a process and a goal to achieve (ibid.). There are contrasting perspectives that arise from the analysis of the 'ability to choose'. As explained above, empowerment entails the freedom and ability to choose as well as the ability of 'choosing not to choose'. In some instances 'choosing not to choose' might be due to unawareness, while in others it could be a strategy that women adopt to cope with different constraints, as explored in the previous section. Power relations influence not only the ability to choose, but also the kinds of choices that people make. It is assumed that when choosing, people make the "right" choice for their wellbeing (and their family's); however, this might not always be the case in terms of an 'outsider'['s] analysis of gender subordination" (Kabeer, 1998:70; 2000a).

I share Kabeer's view, and, being a western feminist researcher, I am aware of the limitations of my position as an 'outsider'; therefore, during my fieldwork in Rajasthan I attempted to listen empathetically to the accounts of the women at the

Barefoot College.[32] Kabeer talks here about the kinds of choices that are imbued in day-to-day practices and in "taken-for-granted rules and norms" (2001:25). Kabeer cites Bourdieu's idea of 'doxa', which are customs and beliefs that are "undiscussed" and, as such, have been naturalised (Bourdieu, 1977:164 cited in Kabeer, 2001). The shift between doxa and critical consciousness happens only when "competing ways of 'being and doing' become available as material and cultural possibilities, so that 'common sense' propositions of culture begin to lose their 'naturalised' character, revealing the underlying arbitrariness of the given social order" (Kabeer, 2001:25). This aspect of the qualification of choice is relevant to this thesis since it allows me to explore the extent to which women participating in the training programme offered by the Barefoot College have been consciously aware of the choices they were making and about the consequences of those choices. I discuss this point further below.

In this part of the definition, Kabeer refers implicitly to 'power to', which indicates women's ability to make their interests and decisions stand out in a controversial situation. It also entails the ability of women to access resources, and control them through a bargaining process, therefore participating in the decision making (Kabeer 2000a; Kishor, 2000 cited in Malholra and Schuler, 2005). Rowlands, for instance, perceives 'power-to' in Foucault's terms, as "productive power", fashioning "new possibilities and actions without domination" (1997:13). The consideration that power influences women's experiences has dual implications since, as Rowlands (1997) highlights, power is as a source of oppression in its abuse (power-over), as a source of empowerment in its use (power-to). Thus, she asserts that some feminists started envisioning women not only as passive actors in a subordinated position, but also as capable of resisting power whether actively, or passively (ibid.). Power is foreseen as capacity and as a resource to be and to do, rather than as dominium over others (Sen, 1995; Kabeer, 1998; 1999b; Kandiyoti, 2004). Power relations do not always entail

[32] I discuss my positionality in Chapter 4.

conflict; this might arise since the actors' perceptions (of both subordinated and dominant) are forged by their subjective interpretation of the social reality and the institutional structures and practices. In this light, power is something that inhabits not only institutions but also people's daily life; what is personal is attributed political significance (ibid).

In Kabeer's eyes, not all choices have the same relevance in terms of empowerment; she claims that: "[s]trategic life choices include where to live, whether and whom to marry, whether to have children, how many children to have, who has custody over children, freedom of movement and association, and so on" (2005:3). These choices then support framing other choices in people's day-to-day life (ibid.). As Mosedale (2003) emphasises, the term 'strategic' is used with a different connotation from the interpretation adopted by Molyneux (1985), Moser and Levy (1986), and Moser (1993). Kabeer (1999b:437) defines strategic choices as those "which are critical for people to live the lives they want"; these diverge from "less consequential choices which may be important for the quality of one's life but do not constitute its defining parameters" (ibid.). On the other hand, Molyneux (1985), and Moser and Levy (1986) theorise that "'strategic' interests and needs are those that challenge women's subordination as women, while their 'practical' interests are those which help them to carry out their gender-assigned roles more easily" (Mosedale, 2005:249). I discuss Molyneux (1985), and Moser and Levy's (1986) theorisations in section 2.5.3.

Contextuality of choices

The second part of the definition reads, "…in a context where this ability [of making choices] was previously denied to them". The definition emphasises that empowerment entails a change from former conditions and status. Those people who were denied their freedom to make choices are empowered when they are ultimately able to choose. This implies that those who are able to make choices are powerful

"but are not empowered because they were not disempowered in the first place" (Kabeer, 2005:14). Although this definition takes into consideration an increased exercise of power, it emerges that the empowerment of an individual or a group is contextual or related to a socially constructed environment. Thus, perhaps women are empowered when they are able to exercise more power compared to other women that live in the same social context. Rocheleau et al. (1996) define these as horizontal power gains. However, if inequalities can be found at multiple levels in consideration to people's status, gender, position and condition in the society, perhaps this comparison operates also in regards to some men living in the same social context. I am referring to those men whose condition and position in society due to their class, caste or status is susceptible to discrimination and injustice. On this point, Kabeer (1999b; 2001) emphasises that there are different levels of power, and, hence, of empowerment; intrinsic power gains (e.g. the ability to make life choices where this was previously denied) may not have instrumental effect. As such, a woman's bargaining power within her household might be reduced compared to her husband's, in laws' or the power exercised by other members of her community (Sharp et al., 2003; Agarwal, 2018b). Although gender inequalities in the division of labour within the market, the State and the community are less evident than in the household, these are shaped by gender roles of production and reproduction and power relations within the household (ibid.). [33]

Challenging structures of constraint

The third part of the definition cites, "empowerment entails a change in the terms on which resources are acquired as much as an increase in access to resources". Changing the ways of acquiring resources, implies challenging the societal structures

[33] Literature on masculinity also highlights how some men dislike the idea of women within their family being empowered (Kabeer, 1994; Goez, 1995).

that constrain the access to, and the control over, resources. As previously discussed, empowerment is defined as a process of transformation (as well as a goal to achieve), and it entails continuous negotiation within what Folbre (1994:54) identifies as "structures of constraint". These include class, race, ethnicity, gender, religion, caste, rules, norms and assets. Folbre refers to the term 'constraint' rather than 'power' in order to express "the complex relationship between agency and structure...[and the issues that] the formation of collective identities and interests...have as much to do with affinity within groups, as conflict among them" (1994:54).[34]

Nevertheless, although rural women might share collective identities and interests (including asset distribution, rules, norms and preferences), this does not automatically imply that they share the same needs (e.g. to give birth because of their biological capabilities, or due to personal choice) (ibid.). These observations emphasise as discussed before, that women inhabit multiple identities since "people occupy multiple, often contradictory positions, because they belong to multiple groups". Women's ability to exercise power is constrained not only by gender, but also by the interaction with other interwoven structures resulting in women's expression of their identity (Folbre, 1994:51). Crenshaw, for instance, in her article about violence against black women, suggests for feminist scholars the "need to account for multiple grounds of identity when considering how the social world is constructed" (1991:1245). As I discussed in section 2.1, feminist views of development contrast those programmes that treat women as a unitary group of analysis and that, therefore, ignore their different interests and needs. Thse kinds of practices reinforce women's subordination. On the contrary, the discussion in this section highlights the importance for development programmes aiming at generating change, of taking into account women's diversity, and they stress the non-homogeneisation of women's interests and needs.

[34] Folbre writes that "[a] structure of [...] constraint [...] fosters group identity and creates common group interests [...] shaping the potential for co-operation and conflict" (1994:57-58).

2.5.2 Dimensions of women's empowerment

In relation to the 'process of change', Kabeer (2001) recognises the combination of three interrelated dimensions of empowerment: resources (material, human and social), agency and achievements. These elements allow me to explore the politics underpinning access and control over resources, decision making processes and the outcomes of women's agency. Resources are conceived as the 'conditions', agency as the 'process', and achievements as the 'outcomes' (ibid.). She explains that these are interrelated: since transformation is key to empowerment, the three dimensions can be interpreted as the routes to the empowerment process (2005). Kabeer's considerations are similar to the "chain of […] process" portrayed by Stromquist; changes in one dimension can influence changes in another dimension (Stromquist, 1999:17; Kabeer, 2005). For instance, greater access to resources can be the result of collective women's struggle; the reverse is also possible since inequalities in one realm can be reproduced in other aspects of people's lives (Kabeer, 2005).

2.5.2.1 Resources: material; human; social

In regards to resources, Kabeer suggests that "[e]mpowerment entails a change in the terms on which resources are acquired as much as an increase in access to resources" (2001:20). Kabeer explains that access to resources does not only entail material gains such as food, income, human capital or land (material resources), but it also includes those skills, knowledge and capabilities that enable individuals to make a choice (human resources) (Kabeer, 2001). It also comprises the social relationships and links that support individuals to make those changes happen (social resources) (ibid.). Resources are seen as enabling factors of empowerment that are acquired through social relations at different levels, including the family, the community, the market and the State (Batliwala, 2015). Present resources are as important as those

that can be expected in future. The latter can be defined as intangible, and are determined by the rules of distribution of resources in the society (Kabeer, 2001). Access to future resources can be allowed or forbidden to certain groups, and hence, establish the boundaries of what can and cannot be chosen (ibid.). Women's empowerment theory seeks to increase the availability of resources (including energy) and promote their access to, and control over them. Control over, entails management of resources, and participation in decision making, as I explain below.

Material resources - access to energy

In rural India, there is evidence of asymmetrical power relations and social inequality concerning access to material resources (such as in terms of secure and reliable access to energy) (Batra and Reio, 2016; Rao, 2017). The lack of energy provision often translates to meagre living and working conditions that inhibit human, social and economic development; availability, management of (or control over), and access to reliable and clean energy for cooking is also an essential contribution to gender equality and social justice (IEA et al., 2018). These are important themes in literature on women's empowerment in development and GED. Reliable and clean energy sources can help satisfy nutritional needs, avoid exposure to fumes from the burning of unsustainable energy sources (e.g. biomass, cow dung, charcoal), which negatively affect women and children's health, and contribute to lessen the environmental impact (ibid.). Good quality and reliable energy services appear to be a precondition for the promotion of income generation activities, either in home-based cottage industries (e.g. tailoring, sewing) or to encourage agriculture production (e.g. mechanical rice husking) (Pachauri et al., 2004; Mohideen, 2012). Contribution to the household's finances might imply not only more financial stability, but also recognition by the family and the community, and the improvement of women's status (Clancy et al., 2004; 2012; Kooijman et al., 2018).

However, among the constraints on women's entrepreneurship in the energy technology sector emerges the lack of financial support in the form of credit for women. Since in dominant patriarchal societies property rights are usually male, women are not entitled to bank accounts and are denied the financial benefits and facilities that could allow them to integrate in the business arena (Oparaocha and Dutta, 2011; Danielsen, 2012; Kaushik, 2015). Existing research on women's empowerment in rural India has identified an important link between the lack of access to material resources and women's empowerment (Leach and Sitaram, 2002; Roy, 2015). Patriarchal customary rights and customs reserve, to the men in the house, the right and power to distribute resources within the household, leaving women in a position of subordination (ibid.). For example, it is often the case in rural areas, of women relying on secondary claims on food, as previously mentioned (Kabeer, 2001; Agarwal, 2018b). These kinds of practices strongly reflect unequal rights and power relations that affect women dramatically, leaving women's rights often "nested" within men's rights (Rocheleau et al., 1996:12). Likewise, in terms of the division of responsibilities at household, community or also at a broader level, there is a social division that is not only gendered, but that is also dictated by other socially constructed constraints including class, status, age, and caste (Kabeer, 2001; Roy, 2015; Agarwal, 2018b).

There are several implications in relation to the availability of, access to, and management of resources including property, water, and energy. Interwoven power patterns interfere in rural women's daily experience; women's understanding of these is core to modelling their empowerment (Nussbaum, 2000). In regards to the relationship between women's empowerment and access to energy, Clancy et al. (2012) claim that access to energy per se (as a material resource) is not enough to facilitate the empowerment process. They recognise a correlation between energy access and empowerment; however, their causality is not easily proven (ibid.). These claims echo Kabeer when she suggests, "how changes in women's resources will

translate into changes in the choice they are able to make will depend, in part, on other aspects of the conditions in which they are making their choices" (1999a:443). It is thus key to explore and understand whether and how other factors (such as access to knowledge and skills, and to social networks and relationships) can contribute to achieve greater empowerment of marginalised rural women.

Human resources – access to education, training and employment in the energy sector

Human resources, according to Kabeer, "are embodied in the individual and encompasses his or her knowledge, skills, creativity, imagination and so on", and influence people's ability to make choices (2001:20). I suggest that these kinds of resources contribute to people's 'human' empowerment and development; they influence women's participation in education on technology programmes, employment, time management and workload, health and wellbeing, and autonomy. Human resources entail allocations, claims and future expectations, and their access echoes the social rules and customs that dictate the distribution of resources and by whom (e.g. by the head of the household who is the decision making authority within the household) (Agarwal, 1997a; ibid.).

Rural women in the global south usually carry out multiple roles as 'producers', 'reproducers' and 'consumers' (Moser, 2003). Since they are mostly responsible for the everyday chores (including childcare, healthcare and cleaning) and for the satisfaction of basic needs (including water, food and fuel), they have learnt how to cope with these multifaceted processes within the household, the community and their surrounding environment (ibid.). Moreover, women are often constrained by these responsibilities that restrain them from participating in the science and technology realms (Cornwall et al., 2007). Gender inequality and other kinds of discrimination are evident in the energy labour market and education where mainly men get training and

are employed in the sector (Clancy et al., 2012; Dutta, 2019).[35]

However, Clancy et al. (2012) suggest that with suitable training women can learn and perform in this field as well as men. In addition, when provided with information on energy technology, rural women can foresee energy solutions and can generate resources that can improve their conditions, and that of their family communities (UNDP, 2004:20; Clancy et al., 2012). In addition, there is also a global call on gender equality, equality in education, and energy access (SDGs 4, 5, 7); therefore, women's engagement in training and educational programmes on energy technology could also contribute to achieve these international goals. Linked to the alienation from training and education in energy technology, is the issue that, the kind of discrimination described above prevents the development of women's working skills and, therefore, their employability (Mohideen, 2012). This kind of constraint subjugates women further. However, GED literature reports positive examples of women's entrepreneurship in the rural energy technology job market. For instance, the UCT et al., (2019) discusses successful example of women's entrepreneurship in village level enterprises that distribute and recharge LED lights in rural Rwanda. Therefore, it is critical to explore how women's engagement in energy technology training can boost their employability skills, and what elements can support women's integration in the rural energy employment arena.

In the following chapter, I investigate the role of popular education as a traditional approach in development to boost women's empowerment by raising their awareness and providing them with employability skills. As mentioned above, in rural areas women perform multiple roles and tasks as reproducers, producers, and community managers (Moser and Levy, 1986; Moser, 1993). On the one hand, Clancy et al. (2004, 2012) suggest that this time, and the time spent on household chores (such as fetching fuel, water and preparing the food) could otherwise be managed

[35] I discuss the issue of women's alienation from science and technology in Chapter 3.

differently; perhaps it could be spent in educational and income generation activities that could contribute to enhance women's skills and status. Access to energy can support freeing women's time and facilitating income generation activities at home (ibid.). On the other hand, there are instances in which development interventions, by engaging women in employment activities, add an extra burden on women's already overloaded agenda (Clancy et al., 2004).

It is necessary for development programmes to investigate whether and how women's participation in such initiatives would benefit them, and whether women would rather spend more time engaging in leisure activities (Clancy et al., 2012).[36] In rural northwest India, women's marginalisation within the domestic sphere, as well as other patriarchal norms and beliefs, constrain their autonomy in terms of mobility, their ability to choose and to become self-reliant (Kaushik, 2015; Dhar et al., 2018).[37] As a result, I found it relevant to explore the extent to which rural women achieve a certain degree of autonomy through their engagement in the Solar Mamas' programme. In this thesis, autonomy refers to expanding beyond the psychological aspect to include the power that people have to realise their own self (including the freedom of choice, freedom of movement, improved self-confidence and reliance), and as operating within multiple spheres and structures, including the community and institutions. Related to the concept of autonomy are issues of choice; thus, there is evidence of a level of interconnectivity among the women's empowerment themes.

[36] I discuss women's empowerment themes in section 2.3.4.

[37] There is controversy in feminist literature on development in regards to the definition of autonomy and on how it differs from empowerment. For instance, Stromquist (1999) distinguishes between cognitive components of empowerment (acknowledgment of the situation of subordination), psychological (development of self-esteem and confidence), economic (access to productive activities that can contribute to financial independency), and political (ability to mobilise and organise social change). Autonomy entails the psychological aspect of empowerment (development of self-esteem and confidence) or the 'power from within' that allows people to exercise and pursue other forms of power (ibid.). Jejeebhoy (2000), in her analysis of autonomy in rural India, instead, portraits autonomy as having a more static character compared to the dynamism of empowerment. She believes that autonomy is the measure in which women exercise control over their lives within their families and in a specific moment in time (ibid.).

Social resources – access to networks through energy technology training programmes

Kabeer defines social resources as:

> the claims, obligations and expectations which inhere in the relationships, networks and connections which prevail in different spheres of life and which enable people to improve their situation and life chances beyond what would be possible through their individual efforts alone (2001:20).

While human resources relate to people's knowledge, skills, and creativity, social resources are attained through multiple social relationships within social institutions such as the family, community, and market (Kabeer, 1999a). Access to social networks and participation in the public arena are also core themes in literature on women's empowerment and development.[38] I suggest that access to these kinds of resources contributes to people's 'social' empowerment and development. Kabeer (1999b) argues that the exclusion from the public sphere and information networks restricts women's awareness of different scenarios to that of their marginalisation. Therefore, this isolation might limit rural women's ability to make informed choices (Kabeer, 1999b). The analysis of social resources is relevant because it enables me to understand social constraints on women's empowerment in the context of rural Rajasthan, and the extent to what social networks and relations created through the participation in energy technology training are key to promote greater change in women's lives.

Although more empirical evidence is required in relation to the decision making

[38] I discuss this further in section 2.5.4.

process, some studies show that men's say has more weight than women's opinions (Cecelski, 2004; Kooijman et al., 2018).[39] On this point, being major users of energy, women would be best suited as "design[ers] and implement[ers of] projects"; however, they are often excluded from the household decision making even though they retain local knowledge (UNDP, 2004:20). As explored before, local beliefs and norms shape women's roles and responsibilities within their household, community and the broader society, and dictate what women are and aren't allowed to do (Roy, 2015; Batra and Reio, 2016; Dhar et al., 2018). There is evidence of a perpetuation of gendered roles and responsibilities, in cases reinforced by the mothers-in-law towards their daughters' (Roy, 2015; Dhar et al., 2018). However, engagement in energy technology training can have positive outcomes for the women participating in it, such as recognition from the community; at times, these benefits also expand to the entire household (Clancy et al., 2012). Therefore, it is critical to explore under what circumstances energy (access, training, etc.) can support overcoming these biases and constraints on women's empowerment, in order to achieve equality and social justice.

As I explain further in the next section, in order to achieve greater empowerment, the process entails challenging social and institutional constraints on women's empowerment (Kabeer 1999a; Mosedale 2003). Feminist literature on empowerment recognises that individual action might not succeed in overcoming these constraints, and identifies the 'power with', or the power through collective action and efforts, as key to generating transformation (Batliwala, 2015; Cornwall, 2016). Participation in social networks is also seen as essential to share experiences and develop solidarity among women (Khamati-Njenga and Clancy, 2005, Karlsson, 2007). Moreover, participation in networks can also promote mobility for rural women and their exposure to the public sphere (ibid.).

[39] For instance, Meikle indicates that in Tanzania decisions regarding energy are taken by and for men, for instance, by purchasing a radio rather than a clean energy stove (2004, cited in Cecelski, 2004).

2.5.2.2 Agency

In Kabeer's (2001) framework, agency expresses people's ability to use resources to their own advantage with the purpose of achieving results that can support them to live the life that they wish. In a broader sense, it also includes the motivation, the meaning that people give or the intention that is behind actions. She also recognises an 'effective' use of agency, which refers to "women's greater efficiency in carrying out their given role and responsibilities" and 'transformative' forms of agency, which relates to women's ability to question, challenge and reframe those roles and responsibilities (Kabeer, 2003:174). 'Effective' and 'transformative' agency can lead to, respectively, 'effective' or practical empowerment, and 'transformative' or strategic empowerment. Hayward suggests that empowerment begins when people become aware, question and then act to change social "boundaries" that shape and frame their lives (1998:27).[40] As Mosedale argues in relation to development interventions, "[d]evelopment agencies cannot therefore empower women – the most they can achieve is to facilitate women empowering themselves. They may be able to create conditions favourable to empowerment but they cannot make it happen" (2003:2). Therefore, Kabeer (1998) emphasises that if empowerment depends on women's choices and actions, the outcomes of the process cannot be decided or speculated a priori. I return to this point and discuss it further in Chapter 3 where I investigate the role of Indian NGOs in facilitating the empowerment of rural women.

'Effective' and 'transformative' agency, if achieved together, are recognised as the strongest form of power in feminist literature on development: the 'power from within' (Rowlands, 1997; Sharp et al., 2003). Women exercise this kind of power when they become active agents by thinking about alternative ways of living (Sharp et al., 2003). Personal preconceptions and interpretation of reality strongly shape people's

[40] See discussion in Chapter 3 section 3.2.1 on consciousness-raising in feminist studies.

agency to challenge societal customs (Hayward, 1998). The 'power from within' is the outcome of an individual and subjective process that starts with women's awareness of their situation. It then leads to increased self-esteem and confidence in their strengths, and gives them a sense of control over their own lives.[41] Therefore, it can be said that empowerment is not only a change in consciousness as such, but a manifest expression of change that is recognised and accepted by the society (Batliwala, 1993; 1994b).

Agency, as discussed earlier, can have a positive connotation – power-to – or a negative one – power-over. The latter is evident in patriarchal societies such as in rural India; it is strongly hierarchical, and therefore leaves many women in a position of subordination (Ibid.). Power-over also operates subtly as in the case of institutional bias that hinders people's action and freedom of choice; therefore, it is perhaps more difficult to challenge (Kabeer, 2001). I bridge these conceptualisations and evaluate the extent to which access to energy and participation in the energy technology training programme of the Barefoot College in remote areas of Rajasthan can facilitate rural women's 'effective' and 'transformative' empowerment as theorised by Kabeer (2001) above, and in line with women's 'transformatory potential' as conceptualised by Young (1997). Agency also implies seeking networks for collective action (Kabeer, 2001). These can be represented by the family, the community, and at a broader scale the market and other institutions (ibid.). This form of joint agency is an expression of the 'power-with', as discussed in the previous section.

Since societal and structural transformation that can bring about long lasting change cannot happen with the efforts of one individual, collective efforts through women's and social networks are key to support the empowerment process (Batliwala, 2015). Hence, the focus of women's efforts and development intervention that support

[41] This discussion is linked to the 'transformatory potential' that women have when assessing their needs and interests as elaborated by Young (1997) that I explore in section 2.5.3 on practical and strategic gender interests and needs.

them is on long-term changes that can challenge inequalities and patriarchal societal structures (Kabeer, 2005). Women's collective action to build networks is seen as the main tool to challenge subordination; a shared identity is at the basis of the majority of women's empowerment strategies (Kabeer, 1999b; Mosedale, 2003). When women act collectively as agents of change to challenge injustice and constraints, this becomes 'power for' social change (Cornwall, 2016). On this point, Stromquist writes:

> [a] prerequisite to empowerment, therefore, necessitates stepping outside the home and participating in some form of collective undertaking that can be successful, thus developing a sense of independence and competence among the women. The creation of a small, cohesive group with which its members may identify closely, is paramount (1999:16).

Nevertheless, Batliwala (2015) suggests that, at the same time, the creation of a collective identity should not undermine the plurality of experiences that are influenced by a diversity of factors including age, ethnicity, social status, religion, and place. On the contrary, emphasis on understanding and integrating individual experiences is also key (ibid). I share Stromquist's (1999) view that empowerment is a chain of actions that starts at micro-level with women's participation in small collectives in order to understand and develop strategies to challenge structures of constraint, and that then moves to the macro-level to transform the social reality as shown in Fig 2.[42]

[42] Stromquist (1999:17) discusses her "[t]heory of [c]hain of [e]vents in the [empowering] [process]". Fig. 1 is elaborated based on Kabeer (2001) and Stromquist's (1999) theorisation of empowerment as a process.

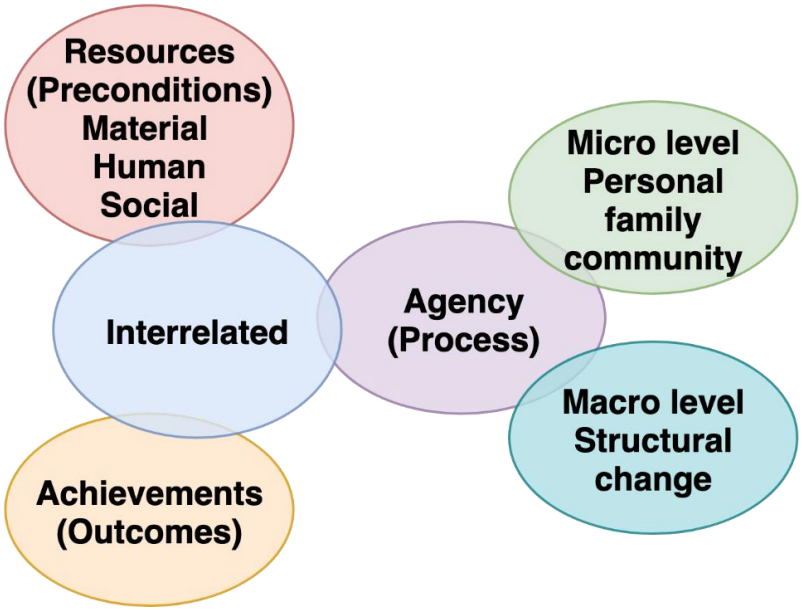

Fig. 2 Women's Empowerment Dimensions (Adapted from Stromquist, 1999; Kabeer, 2001).

Exploring which kinds of negotiations and networking happen in the everyday practices between social actors can support gauging individual needs and interests (Agarwal, 1997b). Resources and agency are referred by Sen (1993) as 'capabilities', or the potential to live the desired life people wish for and to achieve conscious ways of 'being and doing' (Kabeer, 2005). Kabeer (1994) also recognises that the 'ways of doing' strongly relate to the 'ways of thinking'. As I discuss in Chapter 3, NGOs can play an important role changing people's perceptions and their 'thinking' through awareness and consciousness raising.

2.5.2.3 Achievements

Achievements are conceptualised as the outcomes of people's efforts (actions) due to the access to and use of resources. Kabeer (2005) considers both the outcomes and the agency exercised as 'empowerment achievements'. She recognises that failure to achieve valued ways of 'being and doing' can be due either to people's inertia or incompetence, or to uneven distribution of capabilities, and power; this kind of failure

could echo disempowerment (Kabeer, 2001). The evaluation of achievements is not free from contradictions since in each culture and context there are norms that establish women's 'room for manoeuvre'. Some GED and women's empowerment in development scholars (e.g. Skutsch, 1998 cited in, Cecelski, 2005; Karlsson, 2007; Cornwall, 2016) refer to the need of creating a 'safe' and 'enabling' 'room' or environment to facilitate the empowerment process of subordinated women. However, I argue that the concept of 'space' or 'space for manoeuvre' has not been defined and qualified. My thesis builds on these theorisations by suggesting that this kind of space is not only intellectual for consciousness-raising, but also a physical place where vulnerable groups, such as rural women, can experiment with new ideas, and challenge old everyday practices.

Analysis of empowerment dimensions, also brings attention to Kabeer's (2001) distinction between different levels of empowerment (e.g. weak versus strong) depending on the extent to which they contribute to the transformation and to challenging of social and structural norms, as mentioned in the previous section. At the immediate level, change can affect access to resources, agency and achievements; at an intermediate level, it affects institutional rules, access and control over resources; at a deeper level, change also challenges the structural relations that shape the distribution of resources and rights such as class, caste and gender (ibid.). Kabeer also suggests that "[h]owever, for any […] change to translate into meaningful and sustainable processes of empowerment, it must ultimately encompass both individual and structural levels" (2001:27). On this point, feminist scholars recognise that due to the unpredictability of human actions and to the variety of circumstances under which agency is exercised, there is a tendency to interpret social change, like empowerment, as an open ended process (Batliwala 1993, 1994; Kabeer, 2001) This understanding presents several challenges for its measurement. For instance, challenges are represented by the issue that although empowered in one sphere of their life (for

example, in terms of increased education), people could face disempowerment or inequalities in regards to other aspects of their life (e.g. in terms of participation in the decision making) (Kabeer, 2001). Another challenge is represented by the issue that empowerment is not binary: empowered/disempowered (ibid.). The evaluation of empowerment goals facilitates the assessment of achievements or outcomes (ibid.). After consulting literature on feminist methods of measuring empowerment, I consider empowerment as both, an ongoing process, but also as a goal to achieve when assessing outcomes (e.g. Narayan et al., 2000; Kabeer, 2002; Charmes and Wieringa, 2003; Mosedale, 2003; Williams, 2005; Kandpal et al., 2013).

2.5.3 Practical and strategic gender interests

It was Maxine Molyneux (1985), in her study of the Sandinista policies aimed at Nicaraguan women during the 1980s, who first defined and differentiated gender interests into 'practical' and 'strategic'. In the same period, Caroline Moser and Caren Levy (1986) developed a gender planning approach for development programmes and projects that distinguishes between practical and strategic women's needs.[43] Due to gendered norms, roles and responsibilities and due to the 'position' and 'condition' of women in patriarchal societies, including in rural Rajasthan, men and women have different interests and needs. This is also true in relation to the access to energy services and to the benefits deriving from them (Laxmi et al., 2003; Gupta, 2009). Young refers to the 'condition of a woman' as the material state in which the woman finds herself (1988, cited in, Wieringa, 1994).

As for the practical gender interests, people's condition depends on and is influenced by the division of resources and labour. The 'position of women' defines "women's social and economic standing relative to men" (Wieringa, 1994:14).

[43] The discussion of this approach on gender planning for policy and programmes goes beyond the scopes of this thesis. For further readings, see Moser and Levy (1986), and Moser (1993).

Therefore, changing women's position can happen only by challenging the gender construction in society (ibid). It can be said that, greater equality and social justice could be achieved by challenging also other constraints that are framed by women's status, class, and caste. Referring to Molyneux's (1985) conceptualisation of practical and strategic gender interests and needs is relevant to this thesis since it allows me to discover the extent to which their achievement contributes to the empowerment of the rural women engaged in the Solar Mamas' programme (1985). Molyneux (1985), and Moser and Levy's (1986) theorisations led to a new paradigm in the field of feminist social analysis within development studies. Their contribution is extremely relevant in feminist development field since, the distinction between women's practical and strategic interests "has made it possible to think about how to address gender and development issues in a pragmatic way without losing sight of the fundamental changes required to tackle gender inequalities" (Rowlands, 1997:24).

Molyneux argues that practical gender interests "are given inductively and arise from the concrete conditions of women's positioning within the gender division of labor" (1985:233). These kinds of interests derive from unequal gender relations and usually respond to the perception of an immediate need (ibid.) For example, given that women are primarily responsible for the maintenance of the household, they have an interest in providing resources to satisfy basic needs such as food, water, sanitation and education of children. Molyneux conceptualises strategic gender interests as:

> deriv[ing] in the first instance deductively, that is, from the analysis of women's subordination and from the formulation of an alternative, more satisfactory set of arrangements to those which exist […] and these are the ones most frequently considered by feminists as the 'real' interests (1985:233).

The theorisation of practical and strategic gender interests raised controversy in feminist literature on development. Some authors highlight that there is no consensus on the nature and formulation of women's interests, and that, their identification would inevitably lead to the homogeneisation of women from the global south based on their biological characteristics (for instance, Folbre, 1994; Baden and Goetz, 1997).[44] However, other studies show that there are some common challenges that rural women face due to structural inequalities (Kabeer, 2012).[45] Therefore, as Folbre (1994) recognises, women might share collective identities and interests (including asset distribution, rules, norms and preferences), however she also explains that women's needs might be different according to their identities, locality and power. This subjectivity, contextualisation, and locality of women's interests is also emphasised by Kabeer (1999a; 1999b) when she claims that unequal gender structures delimit the position and the condition of women in different contexts and define how men and women perceive their everyday practical needs; sometimes, this can lead to competing interests for the long-term transformation of inequalities. Thus, there is a level of subjectivity when it comes to prioritising interests (ibid).

Another point of discussion that arose from Molyneux's (1985) conceptualisation of practical and strategic gender interests is the assumption that this distinction values strategic interests more than the practical as they have been conceived as the 'real' interests. However, this hierarchy risks reinforcing the division between the public and private, and the personal and political spheres (Hirschmann, 1998). I share Young's understanding of practical and strategic gender interests when she talks about their "transformatory potential" (1993:156). In her view, women assess their needs and interests and find ways to achieve them by themselves since they have the capacity

[44] For further discussion, see (Kandiyoti, 1988; Young, 1993; Hirschmann, 1998).
[45] Commonly identified issues include, male control of women's work, restricted access of women to economic resources and valuable social and political power because of a highly unequal distribution of resources between genders, male violence and control over women's sexuality (Schuler, 1986; Kirby, 1999; Sen, 2001; Kabeer, 2012).

for questioning, challenging or changing relations and structures of subordination (ibid). Nevertheless, I suggest that in some instances, due to women's marginalisation in the domestic sphere, advocacy and awareness raising programmes could support this process by providing them with diverse scenarios than their subordination.

2.5.3.1 The energy dimension of women's practical, productive, and strategic needs and interests

From the analysis of Molyneux (1985), and Moser and Levy's (1986) conceptualisation it emerges that they did not specifically refer to energy as a woman's practical and strategic need or interest. Clancy et al. complement their theorisation and recognise that women's practical, productive and strategic needs "have an energy dimension" (2004:4). These are interrelated in that their achievement contributes to women's 'effective' and 'transformative' empowerment. Clancy et al. (2004; 2012) have categorised women's energy needs and interests as practical (for survival activities such as, improved household lighting, clean energy cooking stoves, etc.), productive (to generate income such as, sewing machines, food processing machines, etc.), and strategic (to achieve greater equality and support women's empowerment such as, street lighting to allow more freedom of movement). The satisfaction of practical energy needs can reduce women's drudgery and ease their daily practices, therefore supporting the achievement of material and immediate needs rather than challenging social inequalities (Clancy et al. 2004; 2012). Productive energy needs "can increase production and the quality of products" and can save women's time and drudgery (Clancy et al. 2004; 2012:11). They can promote income generation using technology and increase business opportunities. By contributing to the household's finances, the achievement of these kinds of needs can support changing women's status within the household and the community (ibid.). In relation to women's strategic energy interest, a few scholars (Havet, 2003; Clancy et al. 2002; 2004; 2012), envisage street lighting

as allowing girls and women to achieve a level of autonomy in terms of freedom of movement. Therefore, they can partake in community events and activities and participate in the public arena. A strategic dimension of energy for rural women's empowerment has also been recognised in the use of TV, radios and communication tools that can support their education and widen their scenarios (ibid.). Table 1 below illustrates some examples of energy use to meet women's needs (adapted from Clancy et al., 2002).

The achievement of practical, productive and strategic energy needs and interests can contribute to improving people's health, wellbeing and their safety (Clancy and Roehr, 2003). These are other core themes in GED and women's empowerment in development literature. Havet (2003) recognises that access to clean energy can increase women and their children's safety since, for instance, traditional stoves can often burn or cause fires. Additionally, mechanical pumps improve the sanitation of drinking water, therefore contributing to the reduction of child mortality (ibid). In addition, lighting outside can improve the security of the household and of animals (Clancy et al., 2012). Since in remote areas women and children spend most of their time in the household, the use of unsustainable energy sources such as, kerosene lamps, can have detrimental consequences for their health and wellbeing (ibid; Clancy et al., 2003). Improved cooking stoves, such as solar cookers, can reduce the emission of noxious fumes and ameliorate the nutritional level of poor families because these kinds of appliances cook food better (Clancy et al., 2003). Other positive outcomes of access to clean energy service relate to the enhancement of people's living and working conditions. For instance, access to lighting can promote income generation activities or improve the conditions under which these are performed (e.g. tailoring, stitching, etc.) (ibid.).

However, some scholars argue that women's engagement in energy programmes, their access to lighting at home, or to electric equipment (e.g. for

agricultural production) can exacerbate their working hours and add an extra burden on their agenda (Clancy and Dutta, 2005; Batliwala, 2010). It is critical to explore whether energy access enables women to have more free time, and whether or not, they engage in leisure activities (e.g., watching TV). As the shown in Table 1 different forms of energy can contribute in a distinctive way to women's needs and interests. I elaborated on this table to inform my conceptual framework. The achievement of the three categories of needs and interests can enable women's 'effective' and 'transformative' empowerment as theorised by Kabeer (2001). In this regard, Clancy et al. (2012) highlight that there is a correlation between access to energy and changes in men and women's lives; however causality is not easy to demonstrate. In the next chapter I investigate what elements, other than access to energy per se, are key to encourage the life transformation and the empowerment of rural women in Rajasthan.

Table 1. Examples of Energy Meeting Women's Needs

Energy Form	**Women's energy needs and issues**		
	Practical needs	**Productive needs**	**Strategic needs**
Small-scale solar energy (Solar Home Systems; solar cookers)	*Lighting *Improving time management *Reduced women's drudgery *Improved cooking/ nutrition	*Increased opportunity for activities in the evening *Increased possibility for income-generation activity (e.g. handicrafts, tailoring, embroidery)	*Educational/reading (intragenerational and intergenerational benefits) *Increased opportunity for recreational activities *Increased safety and security (street/outdoor lights) *Safe mobility for other activities (participation in women and

			community's groups/activities) *Improved health and environmental conditions
Electricity	*Lighting *Improving time management *Reduced women's drudgery *Improved cooking/ nutrition *Pumping of water-reduced the need to carry and haul *Mills for grinding at home and for agricultural processes	*Increased opportunity for activities in the evening * Increased possibility for income-generation activity *Refrigeration for food production and sale *Power for specialised enterprises (e.g. hairdressing, internet cafes)	*Increased safety and security (street/outdoor lights) * Safe mobility for other activities (participation in women and community's groups/activities) *Opening horizons through radio TV and the Internet
Improved Biomass supply and conversion technology	*Reduced women's drudgery	*Increased opportunity for activities in the evening	*Control of natural forests in community forestry management frameworks *Improved health and environmental conditions with better stoves
Mechanical	*Milling and grinding *Transport and portering of water and crops	*Increased variety of enterprises	* Transport allowing access to commercial and social/political opportunities

Liquefied Natural Gas	*Improved cooking and nutrition *Improved heating facilities	* Increased possibility for income-generation activity (e.g. cooking)	*Improved health and environmental conditions

(Adapted from Clancy et al., 2002)

2.5.4 Women's empowerment themes

Core themes for analysing connections between women's empowerment and access to energy resources and training are: availability, access and management of resources (material, including employment and income generation; human, including education, autonomy, increased self-confidence and esteem, enhanced knowledge and awareness, and use of time; social, including participation in decision making, engagement in networks and mobility); these affect women's safety and security, their health and wellbeing, and their empowerment process. The themes are related to the women's empowerment dimensions discussed before in that they contribute specific features to the dimensions (e.g. participation in social networks can contribute to women's social empowerment). Some themes are intersectional in that they affect different aspects of women's lives (e.g. I conceptualise autonomy not only as financial independence but also as personal in terms of the ability to choose). The themes are represented in Fig. 3 (below) that I used to interpret the data during the analysis.[46] I called them themes in order to avoid the language of criteria or indicators that is prescriptive. I identified some as main themes and others as sub themes.

This framework is specifically tailored to evaluate the interconnection between energy access, management, consumption, and training in energy technology with the

[46] The figure is elaborated from Kabeer's (2001) conceptualisation of 'resources', as I discuss in section 2.5.2.1.

empowerment of rural women. It allows me to assess the extent to which these aspects of energy can contribute to achieve the 'effective' and 'transformative' empowerment of the Solar Mamas. Studies show that the access to and the consumption of clean energy, such as solar energy for domestic uses and for cooking, can contribute to improving women's health, their living and working conditions, and their nutrition (e.g. Winther et al., 2017). Additionally, they can offer opportunities for generating revenue (ibid.). As Clancy et al. (2012) suggest a strategic dimension of energy access is that of increasing the safety and security of women and their household, and their mobility; therefore facilitating their participation in the public sphere and their social integration. Education and training in energy technology has the potential to increase women's employability and entrepreneurship in the rural energy technology job market, challenging the gendered division of labour, roles and responsibilities (de Groot et al., 2017; Kooijman et al., 2018). Engagement in popular education programmes can also raise women's awareness of different scenarios to that of their marginalisation and broaden their horizons (Clancy et al., 2004; 2012). Financial independence and consciousness can contribute to women's autonomy and can be catalysts of greater participation in decision making; therefore increasing social equality and justice (Kooijman et al., 2018; Winther et al., 2018).

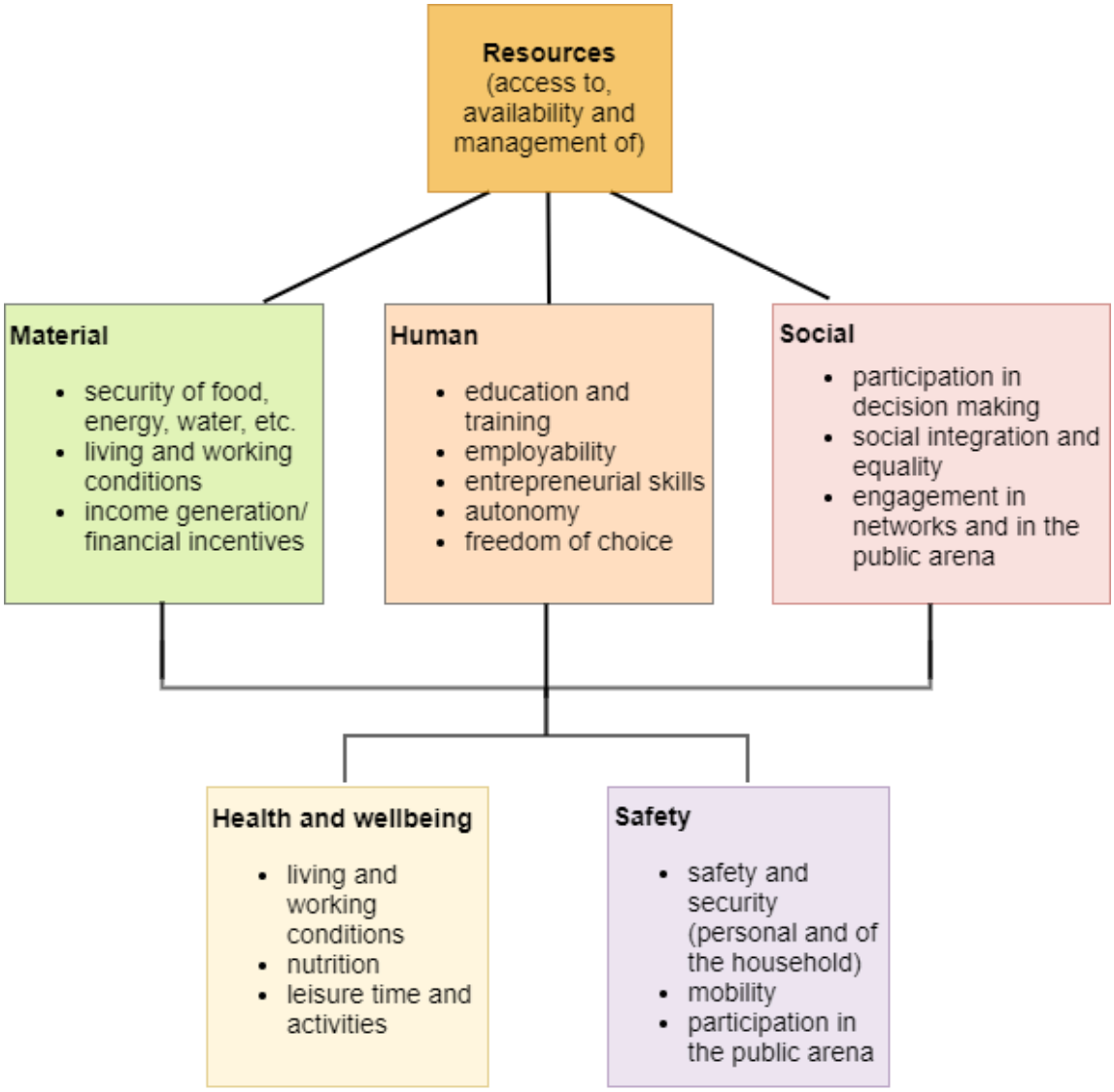

Fig. 3 Women's empowerment themes (Elaborated from Kabeer, 2001)

2.6 Summary

Mainstream development and empowerment approaches often instrumentalise women and girls for the achievement of neoliberal agendas, and depict women as a unitary category of analysis (Chant, 2016; Cornwall, 2016). This can translate in development policies and programmes as pursuing interests that contrast women's own (Chant, 2016). In relation to energy policies and programmes affecting rural areas, they tend to exclude women from training in rural energy technology and from participating in the rural energy job market (Mohideen, 2012). However, GED scholars claim that appropriate training and engagement in energy technology training can

promote rural women's entrepreneurship and their empowerment (e.g. Clancy et al., 2012).

In rural India, there is indication of asymmetrical power relations and social inequality that constrain women's empowerment, their access to resources, including energy, and their participation in education and training programmes (Roy, 2015; Agarwal, 2018b). This is particularly evident in the rural Rajasthani context shaped by specific features of the caste system, the *purdah* religious and patriarchal norms that exacerbate women's subordination (Bidner and Eswaran, 2015; Agarwal, 2018b). The intersection of poverty, marginalisation and patriarchal norms dictate a gender division of labour, roles and responsibilities within the household, the community and at wider level that constraints on gender equality and women's empowerment (ibid.).

The conceptual framework that I developed from the identification of critical themes in literature on women's empowerment and GED, allows me to explore these issues in relation to the participation of rural Rajasthani women in the Solar Mamas' programme of the BC. I evaluate the extent to which this facilitates their 'effective' and 'transformative' empowerment, and generates change in their lives. I argue that although empowerment cannot be granted by others (Mosedale, 2003), because of their marginalisation, some women might be unable to initiate their empowerment alone. Due to the specificity of the rural Rajasthani context discussed above, the intervention of intermediary actors (e.g. NGOs) is critical in creating a 'space for manoeuvre' to facilitate women's conscientisation and agency to challenge their position and condition in society.

Chapter 3. Routes to empowerment: the role of NGOs in facilitating consciousness-raising, employment and rural entrepreneurship

3.0 Introduction

There is a debate in development literature between those scholars who portray NGOs as service providers, and those who think that they can be facilitators of women's empowerment and community development (Kilby, 2011; Ahamad et al., 2015; Sharma and Bornstein, 2016). In India, NGOs have historically played an important role in addressing inequality and supporting marginalised groups, such as rural women (ibid.). NGOs role can be for consciousness-raising, for transferring skills through training, promoting entrepreneurship and providing employment; I suggest that in circumstances of strong marginalisation the intervention of NGOs can be pivotal.

In the first part of this chapter, I review literature on the role of NGOs in development in India, in order to understand the extent to which these can support women's empowerment through energy programmes.[47] In the second part, I review literature on popular education and consciousness-raising in feminist studies to uncover whether and how they can contribute to women's empowerment, their employment and entrepreneurship in the rural energy job market.

3.1 The role of NGOs in promoting women's empowerment in India

3.1.1 Historical and political overview

In this section, I explore the history and politics behind NGOs' work in India, in order to understand what role they play in supporting marginalised groups, including rural women's empowerment and development. The Participatory Research in Asia (PRIA) reports how in India:

[47] Since the empirical research of this thesis focuses on India, I only reviewed literature on the role of NGOs with a specific view on India.

> [i]n the early 1980s, it was felt there was the need for people's participation, conscientisation and empowerment in poverty alleviation, as well as the need to take note of the diversity among the poor on the basis of class, caste, gender and ethnicity (1991 cited in, Rajasekhar, 2000:6).

The Gandhian and Lohiaite philosophies focused on awareness raising and social mobilisation to challenge social, economic and political structures (ibid.). At the time, voluntary organisations played a key role in improving the living conditions of poor communities (ibid.; Sivaramakrishnan and Agrawal, 2003). The establishment of NGOs in India, as recognised institutions working on development, happened after a long journey characterised by a strong governmental regulatory system, mistrust and hostility by local politicians and élites (Sheth and Sethi, 1991; Sen, 1992; 1999; Kilby, 2011). Notwithstanding this opposition, “paradoxically” the government acknowledged NGOs' work to be fundamental in supplying services to villages where the government itself had been unsuccessful (Kilby, 2011:16). However, in doing so, it restricted NGOs' work to the village level, and constrained their participation in the political agenda (Sen, 2002; ibid.). It appears that at the end of the 1990s, NGOs started dealing with more political issues such as people's rights, empowerment and grassroots political activism (Kilby, 2011). The decentralisation to local-level government under the Raj Act of 1992 opened new avenues for NGOs. They went from service provision, to also become monitors, mediators and facilitators of development processes and advocacy at a grassroots level (Sivaramakrishnan and Agrawal, 2003; Kilby, 2011).

As I discuss further in the next sections, this position of facilitators and mediators did not come without challenges: on the one side, NGOs support otherwise alienated groups by, for instance, engaging with them in capacity building and delivering services; on the other side, there is the risk of creating dependency of marginalised

groups on these organisations (ibid.; Ahamad et al., 2015). In terms of NGOs work with women in India, their aims can vary. Some are facilitators of government and other institutions' programmes, some deliver services, such as training, whilst others work on raising local women's conscientisation and support them to challenge institutional constraints on equality (Nagar and Raju, 2003; Kilby, 2011; Ahamad et al., 2015). For instance, programmes include Self-Help Groups (SHGs) and microfinance (ibid.). Janardhan, for example, observes that:

> [i]n large areas of India, women live with many burdens and fears. They carry the burden of neglect and discrimination, household work, looking after siblings and of work outside the home. As girls, they live with the fear of not getting adequate attention, care, nourishment, medical attention and education. With adolescence comes the fear of being sold, sometimes sold in the name of marriage, and sometimes sold into child labour and prostitution. After marriage, a girl's status descends to an even lower level and her subservience becomes institutionalised. There is also fear of loneliness, maladjustments, not being allowed a personhood, mental torture and harassment, and occasionally even death – murdered by her own people (1995:39 cited in Kilby, 2011:27).

Many rural women live in a condition of oppression in the private sphere, preventing them from participating in the public arena, accessing human, social and material resources, and making informed choices (Janardhan, 1995; Kaushik, 2015). In relation to energy access programmes, Cecelski discusses that "[i]n the energy sector, it is easy to identify the kitchen and home as gendered space for women" (2004:60). However, case studies show how, through the participation in energy programmes,

women gained their place within the community by fighting isolation and elevating their status (Khan, 2001 cited in Cecelski, 2004; Standal and Winther, 2016; Standal, 2016).

3.1.2 NGO versus government's education programmes: a dichotomy

A key debate relevant to this thesis is the dichotomy in the development literature between those who support the claim that NGOs replace the role of the government, and those who believe their work to be somehow parallel (Kilby, 2011; Ahamad et al., 2015; Sharma and Bornstein, 2016). This is an important framing because it helps in evaluating the role NGOs play in facilitating the empowerment of marginalised vulnerable groups through development initiatives, and what challenges they support people to overcome in the socio-political context of rural India. Although there are numerous policies and programmes from the Indian Central Government that focus on gender equality and women's empowerment, there is also evidence of discrimination and marginalisation against women (Jandhyala, 2003). As Rajesekhar (2000) comments, development and charity NGOs often seek to supplant the state as the providers of basic services and development programmes, thereby weakening the political relationship between people and their government. This, in turn, can make the government more inefficient in fulfilling its duties towards its citizens (ibid.). However, in other cases, globalisation processes and governmental alienation from service provision for development, can lead NGOs to fill this gap (Nagar and Raju, 2003; Sharma and Bornstein, 2016).

Ahamad et al. (2015), for instance, discuss that the engagement of marginalised women with development-oriented NGOs can be an avenue women's empowerment. Nagar and Raju (2003) discuss examples of how the efforts of NGOs have contributed towards positively changing women's lives. Raju, in particular, describes how some women in rural Rajasthan changed their attitude towards men thanks to their involvement in NGO programmes (ibid.). While previously, they would not dare to talk

to male strangers, and/or talked from behind closed doors, after the engagement with the NGOs, they felt more confident and even talked to men face-to-face (ibid.). In Rajasthan there is evidence of structural discrimination against women in regard to female literacy (the lowest rate in India); to inheritance and land ownership (considering that by law it is followed a patrilinear system); to uneven resources distribution (including food and nutrition, education, rights, employment and health care); and there is a strong bias against female children (GOI, 2006; Tandon and Sharma, 2006; Singh, and Kumud, 2013; Mitra, 2014). Thus, perhaps, by being closer to and by better understanding women's struggles in context, local grassroots organisations are better suited to support the development of a strategic agenda for transformative empowerment in its human, social, economic and political aspects.

There are reported cases of government development interventions, in the energy sector, encountering several challenges on their implementation. It appears in these cases that support from NGOs is pivotal. Chaurey et al. (2004), for instance, mentions that the Rajasthan Renewable Energy Corporation (RREC) scheme, launched by the government to address energy poverty issues in rural areas, is constrained by the lack of financial resources and infrastructure. They claim, “[u]nless the local community and NGOs pitch in with some alternate delivery scheme”, this initiative alone would not be able to provide energy facilities to off-grid poor communities (Chaurey et al., 2004:1700). Government programs in India have been targeting disadvantaged women since the 1970s to promote social inclusion and equality. For instance, the government produced The Status of Women Committee Report in 1974, which is considered a landmark document (Kilby, 2011; Sharma and Bornstein and Sharma, 2016). Jandhyala (2003) discusses that historically, educational programmes for women and girls have been core to the national agenda in India. In the 1970s and 1980s, the growth of women's movements brought to light the ineffectiveness of development programmes and the need for engendering the

educational discourse (ibid.). However, despite progressive policies focusing on gender equality and women's rights, many women in remote areas find themselves marginalised and disempowered (Saigal and Sarawat, 2013; Spary, 2019).

In 1986, the GOI published the National Policy on Education. It is considered the first official policy addressing gender asymmetries; it has a section on Education for Women's Equality focusing on empowerment as a precondition for women's participation in education (Jandhyala, 2003). Jandhyala, discusses that the policy commitment that "education will be used as an agent of basic change in the status of women" was turned into the strategy of the *Mahila Samakhya* (MS) (meaning 'Women Valued as Equal') programme of Education for Women's Empowerment launched by the Ministry of Education, Government of India, in 1988 (2003:3).[48] The strategy, now operating all over the country, organises rural women into collectives within hamlets and villages to raise other women's awareness about women's rights, political and social issues concerning women (Nagar and Raju, 2003). The MS programme agenda emphasises transformative empowerment; this implies that women could only challenge institutional and cultural barriers to education through their empowerment. The programme is conceptualised and delivered by women (Jandhyala, 2003). Nevertheless, among the challenges, there was the redefinition of education as a tool to:

> [h]elp women to question rather than accept, enable them to affirm their own potential and sustaining processes that would enable women to move from situations of passive acceptance of their situation to assertion and collective action, in short to take control of their lives […] (Jandhyala, 2003:3).

[48] In 1987 it was also launched the STEP (Support to Training-cum-Employment for Women) programme focusing on skills transfer to offer employment opportunities for women living below the poverty line (Saigal and Sarawat, 2013). In addition, 2001 was declared as the 'Women's Empowerment Year' to promote initiatives in favour of women's empowerment and gender equality (ibid.).

Batliwala (2015) discusses an example of the MS in Tegampura, a remote village in Karnakata, South India. She points out how:

> [the support from the MS activists] helped the women look at their reality with new eyes […to] voice and analyse their sense of injustice…and believe in their power to change things themselves. This is how the women of Tegampura experienced and demonstrated the meaning of empowerment (2015:67).[49]

However, although progressive, the programme presented several contradictions as Nagar and Raju (2003) review in detail.[50]

The Committee on the Status of Women in India (CSWI) set up the National Commission for Women in 1992: to review the Constitutional and legal safeguards for women; recommend remedial legislative measures, facilitate redress of grievances, and advice the Government on all policy matters affecting women (GOI, 2019). The Commission elaborated the National Perspective Plan for Women (1988-2000), to "create a central body for women to address their needs and interests" (GOI, 2001).

[49] *Dalits* (the oppressed and listed in the Scheduled Castes of 'untouchables' in the Indian Constitution) communities were forced to perform a begging ritual at the end of their working day in the field to get food from their landlords (Batliwala, 2015). After a few meetings with activists from the MS programme, women of the community autonomously decided to rebel against this humiliating ritual and asked for their wages (ibid.). Although they found resistance from the men of their village, determined to change their situation, they organised themselves in *sanghas* (women collectives), and raised awareness among nearby villages (ibid.). Refusing to collect the crops until they got their wages, and struggling for a few weeks without food, they won their battle, gained their wages and ceased the degrading ritual. For more details about the MS programme in Karnataka, see Batliwala (2015:64-67).

[50] Nagar and Raju, discuss that through the MS programme women got involved also in education and income generation activities (2003). Previously marginalised women got access to tube-wells and were invited to partake in some social events; however, in order to achieve this social shift, women had to transport daily heavy head-pumps equipment for a long distance and with a lower wage than men doing the same job (ibid.).

Moreover, the government adopted a series of Five-Year Plans promoting gender equality and women's empowerment; by 2011, it had over 27 schemes for women Goyal and Parkash (2011).[51] In addition, 2001 was declared as the 'Women's Empowerment Year' to promote initiatives in favour of women's empowerment and gender equality (Saigal and Sarawat, 2013). However, giving voice to women, enabling them to question their reality and to act to transform it, can be particularly challenging when day-to-day life in India has strong contradictions.

According to Kilby, for instance, the Hindu nationalist movement, hindutva, "has afforded new 'safer' roles and status for women, such as performing Hindu rituals and meeting with other women on religious issues […]" consequently shifting women's role in the public sphere from a social and political one, to a religious (Kilby, 2011:28). Parker et al. (2003, cited in Kilby, 2011) observe how women working outside the household are seen as desperate and 'poverty-driven', rather than champions of poverty eradication. This social trend is not only reinforcing women's traditional roles and responsibilities, but it is also setting out boundaries as to how far 'empowerment' and other social progress for women can go. Dress codes, for example, become important, along with marriage alliances and feminine 'modesty', which to some might be seen as code for submissiveness, and to "uphold the patriarchal family and to be the ideal wife/daughter/sister/mother […]" (Kilby, 2011:28; Srinivasan, 2007:126 cited in). In light of the above discussion, it is possible that the work of organisations, such as the Barefoot College, can provide those rural women that live marginalised with an alternative scenario to their isolation. If their aim is to facilitate social equality and women's participation in decision-making, then they can support the challenging of

[51] The analysis of the Indian Government's plans and policies on gender equality and women's empowerment goes beyond the scope of this study. For a list of some of the Government of India's schemes promoting women's empowerment and gender equality, see Goyal and Parkash (2011).

constraints on women's empowerment that are dictated by the intersection of poverty, gender, age, religion and social customs.

3.1.3 The NGOs dilemma: facilitators of empowerment or service providers?

As previously mentioned, there is debate in literature on NGOs and development, over whether NGOs' role is that of service providers, therefore complementing or supplanting government's work, or rather they should be facilitators of the empowerment of vulnerable groups not only in regards to educational programmes (Nagar and Raju, 2003; Kilby, 2011; Ahamad et al., 2015; Sharma and Bornstein, 2016). This debate is central to my thesis because it unveils context-specific challenges of NGOs in India, and justifies their intervention in cases of social inequality and injustice against marginalised groups such as rural women, which are not addressed by other institutions. NGOs are associated with greater democratisation, public participation, distributive justice and the representation of socially secluded groups (Feldman, 1997; Ahamad et al., 2015; Bornstein and Sharma, 2016). Given that in poor countries of the global south governments often fail to meet development objectives including gender equality, economic growth, and social justice, NGOs, and private sector organisations, provide alternatives to meet these demands (ibid.). By working at the grassroots level NGOs can offer a platform for strengthening civil society and not only alleviate material poverty, but also overcome the structural disadvantage that marginalisation brings (Kilby, 2004). It remains to be seen whether the achievement of women's empowerment at the grassroots level could represent a step also towards the realisation of broader development goals on gender equality in education, employment and women's empowerment.

According to Fernando and Heston (1997), in the 1980s-1990s, the work of Paulo Freire (1970; 1985; 1998) influenced the approach of development NGOs. Freire

argued that broader change would be achievable only with the education and social mobilisation of the oppressed. Hence, NGOs' efforts towards empowerment often translate into investing into local human and natural resources in order to support, for instance, inclusion, transparency, accountability and access to information (Islam, 2014). However, NGOs are situated within rapidly changing social and political constructs. How effectively do they respond to such changes? (Fernando, 1997). ul Haq (2002) observes how NGOs are dealing with and adapting to professionalisation, the expectations of donors, government or other international institutions, and marketisation of their agendas under the pressure of globalisation and social change. On the one hand, they need to respond effectively and efficiently to the requirements of donors and or the government; on the other hand, they serve as facilitators of local activism, and act as empowerment agents (Sen, 1999; Anand, 2002; Ahamad et al., 2015; Sharma and Bornstein and Sharma, 2016). While having to comply with prescribed deadlines for service provision under donors' requirements, they must also balance this with the empowerment process of marginalised groups, which requires instead a degree of flexibility (Kilby, 2011). How then can NGOs deal with these challenges without compromising their accountability towards their communities? As I discuss later in this chapter, the issues of priority setting and accountability of NGOs requires a process of internal negotiation. Studies focusing on the role of NGOs in development claim that these can support development goals such as empowerment through service delivery (for instance, Sen, 1999, Karlekar, 2004). Development literature has identified several questions in this regard: what would happen without the support of NGOs? How can NGOs foster the autonomy of these groups? These are key debates in international development that are still relevant today. I discuss three main ones.

First, it is argued that by providing services, NGOs can only help achieve a weaker form of empowerment, since this is not started directly by the affected groups

(Lingam, 2007). Therefore, they do not challenge existing power relations. It should not be discounted that the empowerment process starts with people's conscientisation, enabling them to challenge power relations. Due to their position and condition in society, some marginalised groups, such as illiterate rural women, might not be individually able to challenge social constraints, or, they might be unaware of alternative scenarios to their marginalisation. Additionally, poor disenfranchised people do need service delivery for the satisfaction of their basic needs and to allowing further development. Although this might be considered a ‘weaker' form of empowerment, as a feminist researcher interested in understanding rural women's struggles I am aware of the challenges of measuring their empowerment (weaker versus stronger). As such, adopting a bottom-up approach, marginalised groups should decide by themselves upon their empowerment. Perhaps, as Jahan (1996) indicates, since women are not a homogeneous category, any core agenda from international organisations or NGOs on the ground aiming at achieving women's empowerment needs to consider the interests of different groups of women. I suggest that, where there are asymmetric power relations and unequal access to resources, processes, such as prioritising and bargaining within and outside the household, are the outcomes of individual and personal decisions. Empowerment, as such, should be contextualised in space and time since there is not a blueprint; on the contrary, women's empowerment can be quite puzzling due to the diverse experiences and perceptions that characterise women's individuality and identity.

Second, as Roy points out, a key debate in the NGOs discourse is whether service provision re-creates “antithetical power structures, and the substitution for marginalized communities of one kind of dependency (on the government) with another (on NGO)” (Roy, 1995 cited in Nagar and Raju, 2003:2). Other authors also emphasise the risk of creating the dependency of disenfranchised groups on NGOs (Kothari, 1987; Robinson, 1998 cited in, Kilby, 2011). Nagar and Raju (2003) make the

valuable point that subverting oppressive power relations, involves unravelling internalised oppression and bringing about systemic change. NGOs, in their role as facilitators and mediators, can support these processes because they best understand local struggles and concerns (ibid.).

Third, linked to the issue of dependency, as Kilby observes, there is the danger of NGOs taking on a “paternalistic role”, therefore putting at risk the accountability to their constituencies (Kilby, 2011:23). On the one hand, this can imply shifting priorities, and on the other hand, it raises the question of how NGOs can ensure beneficiaries' autonomy in different areas, because autonomy is essential to the concept of empowerment (Rajasekhar, 2000). Kilby (2011) emphasises that there is a strong relationship of accountability between the NGOs and the communities engaged in programmes, as though, empowerment is not something given to the communities, but it is inherent to this relationship. He observes that the role of NGOs in promoting empowerment is to manage “a delicate balance of […] power relations and enabling equitable and fair outcomes for the group. This is where the purpose of the NGOs comes into play” (2011:42). If this equilibrium is reached, NGOs can support the empowerment of marginalised groups (ibid.). Issues such as the privatisation, mechanisation and globalisation of rural production create a demand for technical skills to secure rural households subsistence (Feldman, 1997). NGOs that work on training and awareness raising can contribute to reshaping gender relations and increasing opportunities for women also to participate in the rural energy technology labour market (Dutta, 2019). On the other hand, women also have to play an active role if they want to be agents of their own change (Jahan, 1996).

3.2 The role of NGOs in popular education

3.2.1 Popular education and consciousness-raising: a feminist perspective

In this and the following section, drawing on feminist literature on consciousness-raising, I explore the role of popular education by NGOs in raising rural women's awareness and in contributing to their empowerment. Popular education is a method of building capacity of vulnerable groups, such as rural women, through non-formal tools and practices including training, peer-to-peer learning, traditional knowledge exchange (which can support consciousness-raising) and transferring skills and knowledge. In this framing, popular education differs from traditional forms of education such as schooling. The extent to which popular education programmes delivered by NGOs can facilitate the empowerment of rural women is relevant to my purposes. Popular education theory emphasises that what people learn through life is as important as the knowledge acquired through formal education (Wiggins, 2011a). Non-formal education foresees the daily-life experiences and informal learning as the tools through which, otherwise alienated groups, including rural women, can develop starting from their inter-relations with others and from self-reflection (Apple, 2013).[52] Batliwala adds that:

> [e]ducation […] provides exposure and access to new ideas and ways of thinking, and triggers a demand for change. Empowerment education seeks to build critical consciousness, analytical thinking, and the knowledge and skills to act for change (2015:50).

She asserts that popular education, in the form of informal education programmes for rural women in India, are essential for mobilising women to work towards their equality

[52] While the definition of education, as conceptualised by Wiggins (2011a) and Apple (2013), entails the knowledge and the experience attained through life, literacy, is intended as the ability to read, write and use numeracy.

and empowerment (Batliwala, 1994a; 2015). Based on her experience in investigating empowerment in 25 organisations in South Asia and after discussing with several feminist activists, she recognises some key elements of empowerment: (i) creating critical consciousness (including of the self); (ii) access to knowledge and information; (iii) developing new skills; (iv) collective or organisation-building; and (v) alternative educational opportunities (especially for women and girls) (Batliwala, 1994a:63). Batliwala states that empowerment approaches: acquired

> tried to depart from past interventions that treated women as beneficiaries of services or producers or workers, and adopted feminist popular education strategies that created new spaces for women to collectivise…critically analyse the structures and ideologies that sustained and reinforced their oppression, and raise consciousness of their own sense of subordination (2007:2).

In addition, while access to education can be a catalyst for the empowerment of rural women, transformation happens when women exercise their agency to challenge constraints on their empowerment, such as by participating in decision making. Therefore, grassroots initiatives that embrace empowerment models, such as the ones described by Batliwala (1994a), can play a pivotal role in supporting marginalised women to raise their consciousness, enhance their skills and self-confidence and contribute to their empowerment.

According to some feminist authors, there is no single experience of oppression; Batliwala (2015), in particular, emphasises the need to give gender an integral place in the analysis to include women's gender-specific experiences and viewpoints. She writes how education is essential to the process of empowerment considering that consciousness-raising is in itself an educational process (ibid.). This view, perhaps,

contrasts Agarwal's (1994a) accounts when she writes about what she learnt from the interaction with rural women in India. She claims, "for poor women's empowerment, what is needed is less the raising of consciousness and more the strengthening of their ability to overtly protest and mobilise for change" (Agarwal, 1994a:254). While Agarwal's (1994a) point is relevant to achieving greater empowerment, such as by challenging institutional structures, I suggest that there are different levels of engagement for marginalised women depending on the socio-political context in which they live. For those women who face multiple constraints, including caste, class, status, gender, and the *purdah*, which limit their empowerment, consciousness-raising could be an essential starting point that can lead to generating greater change. It might also be the case that those women who live constrained within their domestic realm are not aware of different scenarios to that of their marginalisation, and they do not feel legitimate to act against it. Thus, introducing measures such as consciousness-raising and advocacy implies to transform social and gender relations and to challenge the sexual division of labour. These might be suitable for supporting, shaping and achieving strategic gender interests and needs (March et al., 1999).

In relation to non-formal training programmes on energy technology, GED literature suggests that they can shape people's awareness and contribute to their thinking about the society they live in; additionally, they can also enable them to take action to transform it.[53] Batliwala (1994a); Batliwala and Reddy, (2003); Batliwala,

[53] GED literature discusses some examples of NGO-driven projects in south Asia that engaged women on advocacy and capacity building programmes on energy. These include, the Asia Regional Cookstove Program (ARECOP) that engaged women in decision making and monitoring and evaluation of the project; the case study on improved woodstove dissemination in Karnataka where women became woodstove entrepreneurs; the Kopernik's Wonder Women in Indonesia that empowers women to sell solar equipment (e.g. solar lanterns, solar cookstoves and water filters) providing them with management business training (Bhogle, 2003 cited in UNDP, 2004; Panjwani and Cecelski, 2003; Dutta et al., 2017).

(2015); Clancy et al. (2004; 2012), for instance, refer to awareness and consciousness-raising as core elements of rural women's empowerment process.[54]

Feminist studies define consciousness-raising:

> as a process where women learned to ask new questions about themselves, built self-esteem and a sense of entitlement to opportunity […]. Consciousness-raising was a foundation for change […] (Kamen, 1991:4 cited in Sowards and Renegar, 2004:536).

Sarachild, (1970) and Rosen, (2000) suggest that consciousness-raising for women is entrenched with the recognition of personal oppression (cited in Sowards and Renegar, 2004). From the recognition of their position and condition in society, women start self-reflecting and questioning social inequalities; the following step is that of taking action and challenging preconceptions. This course of actions and reflections implies gains in self-esteem, education, information, rights, and in power. Hence, those who have been denied full participation in the society, including vulnerable rural women, can subvert their circumstances through education and training programmes. Cornwall writes:

> where empowerment initiatives include a dimension to actively engage women in critical, conscious reflection on their own circumstances and to share that process with other women—[…] what feminists might describe

[54] I am aware that the concepts of consciousness-raising and awareness raising might have different nuances, however they both relate to the process of marginalised or vulnerable groups of becoming aware, critically thinking and alter situations or structures. It is insightful to point out that perhaps, the discourse and the language is changing. While traditionally feminist studies refers to consciousness-raising, GED literature mainly refers to awareness raising and capacity building.

as ‘consciousness raising’—there can be a marked enhancement of a programme or project’s transformative effects (2016:347).

Cornwall (2016) also refers to Batliwala (1993) and Kabeer’s (1994) accounts of consciousness-raising and mobilisation at a grassroots level in India and Bangladesh; these processes facilitate people to become aware of their social relations, traditions, and beliefs with potential for transformation (ibid.). Consciousness-raising and education are interrelated. Consciousness-raising, like empowerment, is a process that cannot be given to people but that arises from people's personal and individual understanding of reality and their choices. Empowerment can be seen as a process developing in concentric circles that starts with an individuals’ self-awareness of their own empowerment, and then moves to the family, the community, and the society as a whole (Fig. 4, adapted from Hughes, 1996). Therefore, education and conscientisation are fundamental to achieve greater equality, development and empowerment.

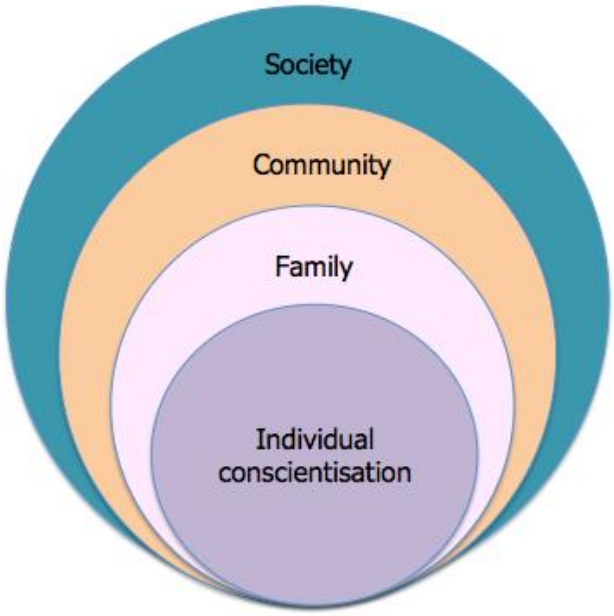

Fig. 4 Circles of empowerment (Adapted from Hughes, 1996)

3.2.3 Popular education in energy development programmes

Global development goals call for inclusive and quality education, and encourage lifelong learning for all (UN, 2015). Several authors, including Batliwala and Reddy, (2003), Panjwani and Cecelski, (2003), Clancy et al., (2004), and Handy et al., (2004), argue that education has been traditionally considered as an indicator and an enabling factor of empowerment. The UNDP highlight how training and skills transfer on energy by NGOs can have “some significant and profound impacts, ranging from the practical, quantifiable advantages of lighting and community income, to qualitative outcomes such as solidarity and empowerment” (2004:21). Addressing these goals poses several questions regarding how they can be implemented at the local level and enable transformation. The international development field also recognises that technology education and training are pathways to achieve greater empowerment of otherwise disenfranchised women. The report from the Platform for Action of the Fourth World Conference on Women, for instance, highlights:

> [w]omen should be enabled to benefit from an ongoing acquisition of knowledge and skills beyond those acquired during youth. This concept of lifelong learning includes knowledge and skills gained in formal education and training, as well as learning that occurs in informal ways, including volunteer activity, unremunerated work and traditional knowledge (UN, 1995: point 73).

However, development programmes have often been prescriptive in their way of ‘delivering services' to poor communities, perhaps putting at risk the achievement of wider empowerment. Stromquist (2015) observes that there has been a tendency of such programmes to address unidimensional empowerment, by, for instance, focusing on empowerment knowledge only. As previously discussed, in order for empowerment

to be transformative, it needs to affect the wider sphere of people's lives. Some educational programmes for adult women focus on unidimensional empowerment by providing them with education and training (ibid.). While this can be considered a step forward in the empowerment journey, to achieve empowerment also in other remits, women's awareness and agency should then be expand to other areas of their lives, for instance, by providing them with income generation opportunities, participation in the socio-political sphere, and safeguarding their rights (ibid.). To what extent can educational programmes support transformative empowerment? How can they contribute to the empowerment of marginalised women?

Panjwani and Cecelski discuss several energy programmes run by NGOs in India and in south Asia where, through capacity building and advocacy, marginalised rural women "gained self-esteem and respect in their communities by earning a decent income…or by taking up income-generating activities" (2003:54). Training also contributed to "[p]romoting and facilitating the expansion of professional skills among mountain women and also their entrance into positions of professional importance and in the commercial sector" (Panjwani and Cecelski, 2003:65).[55] This approach can enable greater employment of women in the rural energy job market. In their recommendation for future research and practice in GED field, Clancy et al. recognise the urgency of "[e]ducat[ing] people (particularly women) about the benefits of renewable energy, and its potential for improving quality of life, by providing appropriate materials and training courses" and:

> [s]upport capacity building and partnerships of women and men involved in renewable energy so as to enable the development of a critical mass of

[55] The projects mentioned here are the 'All India Women's Conference (AIWC)' and the 'International Centre for Integrated Mountain Development (ICIMOD)'. For more projects on energy technology training see, for example, Panjwani and Cecelski, 2003, and Dutta et al., 2017).

> women and men with the capabilities to change the policies, programmes, and practices that affect women and their energy choices (2004:28).

In order to address local women's struggles, development programmes should focus on understanding their reality by contextualising, in time and space, their experiences and knowledge. Clancy et al. (2004; 2012) identify that rural women might be particularly affected by the lack of energy services and educational programmes on energy. Although when tackling household energy both women and men play a role, many rural women are in a position of disadvantage compared to men in different areas of their lives (such as in relation to employment, education, land ownership, and so on) (ibid.; Chant, 2006; 2016). Therefore, Clancy et al., suggest that:

> special elements need to be included in projects and programmes to address these gender differences to ensure that anyone who wishes to participate and benefit is not excluded on the grounds of lack of assets (2004:6).

Similarly, Wamukonya and Skutsch point out that:

> [w]omen generally have a lower confidence level to spontaneously take up technologies, but with the right sort of training and support can do so most enthusiastically and successfully […].This would suggest the need for technology transfer projects, which specifically target women both to meet their specific needs and to bridge their technical knowledge gaps. However, not everyone supports this approach, fearing male resentment and backlash (2001 cited in, Clancy, 2003:14).

As I discussed in Chapter 2, practical and strategic gender interests and needs also exist in relation to energy. The achievement of strategic interests might enable both effective and transformative empowerment. The situation discussed by Clancy (2003) can be true especially in rural areas of Rajasthan where there are strong customs that marginalise many women. Therefore, it is not only about technical know-how transfer and getting a high number of women trained; educational programmes that aim at contributing to women's 'effective' and 'transformative' empowerment should enhance women's awareness and their capacity to generate change (Clancy et al., 2002). Yet, if experiences and knowledge exchange among people in a specific context contribute to their education, socio-cultural values and norms might underpin and limit the educational process. In remote areas of Rajasthan, these kinds of restraints are due to the intersection of multiple constraints such as class, caste, status, religion, the *purdah* and patriarchy (Agarwal, 1997a). Walters and Manicom observe that: "[a]dult education that is to 'empower' women must challenge th[is…] ideology and practice. It must contribute to meaningful change in the condition and position of women" (1996:32). Who can offer such an enabling environment? How can grassroots programmes support the achievement of international goals? As Wiggins suggests, one way of tackling this global call should be for educators and organisers to share the life experience of those they want to teach and/or organise, in order to understand and address people's aspiration and change their reality (2011a). Informed by this literature, one of the things I was interested to explore in the case study of the Barefoot College was the extent to which engaging rural women in training can support them to understand better societal structures and to learn about the tools available to potentially overcome inequality and achieve greater empowerment.

3.3 Women's empowerment as a route to employment and entrepreneurship in the energy sector

3.3.1 Women's alienation from science and technology

Many women in the global south are often excluded from participating in science and technology training. In this section, I explore the interrelation between women's empowerment, women's employment in the rural energy technology job market, and women's entrepreneurship in it. Women living in rural areas of the global south share a number of common life circumstances. As previously explored, due to prescribed roles, responsibilities, the gendered division of labour, and:

> because of their low levels of literacy and lack of access to technical education, [women] are therefore at an even more disadvantaged position than men in developing countries to fully benefit from knowledge networking (Nath, 2001:334).

Additionally, as Clancy et al. indicate:

> [w]omen's technical skills are often less than men's, for example, compared to men, women's reading levels are lower and they have less experience with hardware. This means that when making energy interventions to help people move out of poverty, the ability of women to respond is more restricted than men […] (2004:6).

This division of knowledge and duties prevents women from participating in training and jobs networks and, therefore, from achieving their independence and empowerment. Whilst rural women might yet be involved in traditional economic activities, this separation, as Rocheleau et al. (1996) observe, is even more evident in the science and technology fields precluding women's participation in it. Issues, such as the "separation of domains of knowledge, as well as the separation of knowing and doing, and the 'formal' and 'informal' knowledge" between men and women, and the

(lack of) recognition of women's traditional knowledge, are well known themes in feminist development literature (Rocheleau et al., 1996:8). Rocheleau et al. write, “[t]he conflict revolves around the separation of domains of knowledge, as well as the separation of knowing and doing, and the ‘formal’ and ‘informal’ knowledge” that women accrue through other processes, including while socialising (1996:8). Hence, in rural areas, perhaps women valorise the significance of adopting a more integrative and holistic approach to learning (Rocheleau et al., 1996).

In particular, in regard to women’s participation in energy technology training there is some evidence that technology and mechanisation of processes ”ha[ve] a highly masculine image which deters women” (Batliwala and Reddy, 2003; Clancy et al., 2004:22; Dutta et al., 2017).[56] Specialised science ignores and underestimates women's experiential and informal knowledge (Harding, 1986, Haraway, 2013). Indigenous women's traditional knowledge and experience of agricultural processes, soil and plants are undervalued and disregarded; priority is given to “‘[s]cientific knowledge' with women's marginalisation from it” (Agarwal, 1992:135; Agarwal, 2009; Kelkar, 2009). Nevertheless, it should be recognised that, just due to the gendered division of labour and responsibilities within the household, since very young, girls acquire resource management skills (including gathering and managing fuel); therefore playing an important role in energy management (Batliwala and Reddy, 2003). In relation to energy programmes, while women's traditional expertise of biomass energy in the fields of forestry and cooking fires is often mentioned, their contribution in non-biomass energy is less often referred to (Cecelski, 2000a cited in Cecelski, 2004). These issues are well known at the international level. The Beijing Platform for Action (BPfA) (1995), for instance, recognises problems and proposes recommendations regarding the depiction and position of women in relation to technology:

[56] For instance, Roehr discusses that historically, “when the “green” movement became “professionalised”, men took over the strategic positions and so weakened women’s opportunities” (2001, cited in Clancy et al., 2004:20).

> [r]esearch and anecdotal evidence suggests that women's portrayal is by and large about their role in the home. Women's identity, ambition, [and] self-worth is all linked to spouses and children. Rarely are women shown as individuals, or persons of worth […a]nd, they are often presented as victims (WomenAction, 2000).

Moreover, the Platform for Action of the Fourth World Conference on Women reports that:

> [s]cience curricula in particular are gender-biased […]. Girls are often deprived of basic education in …science and technical training, which provide knowledge they could apply to improve their daily lives and enhance their employment opportunities. Advanced study in [these subjects] prepares women to take an active role in the technological and industrial development of their countries, thus necessitating a diverse approach to vocational and technical training. Technology is rapidly changing the world and has also affected the developing countries. It is essential that women not only benefit from technology, but also participate in the process from the design to the application, monitoring and evaluation stages (UN, 1995: point 75).

These issues are contrasted by a tendency of donors and development agencies to reserve training and managerial roles to men, therefore undervaluing women's knowledge and practices, and hindering their participation as active agents (Carney, 1992, Schroeder, 1999, Kooijman et al., 2018). Regarding energy projects and programmes, UNDP assert, “[w]omen are often excluded from training on the

maintenance of solar home systems (e.g., topping up the water in the battery) despite being around the household more than men" (2004:47).

In India, with few exceptions, the only available opportunity for rural women is often informal low-paid and hazardous work (Desai et al., 2010; Srivastava and Srivastava, 2010). Some positive examples of women's engagement in technology in India are offered by the SEWA that provides a range of e-services including audio-visual training for education and development and Information Communication and Technology (ICT) centres run by rural women to overcome alienation, network and learn new entrepreneurial skills (Cecchini and Scott, 2003; UNDP, 2012; IFWEA, 2019). Knowledge transfer, accompanied by social security, better employment conditions and steady jobs with higher income, can contribute to overcoming discrimination, women's segregation and income inequality (Kabeer, 2012). Without falling into the trap of instrumentalising women for specific purposes, which is an approach that has been criticised by feminist scholars, some authors argue that women's access to resources such as employment, education, financial and so on, has positive impacts for the household as a whole (e.g. better healthcare and nutrition, improved children's education, and so on) (Agarwal, 1997a; Kabeer, 2012; Batliwala, 2015). However, social norms and customs influence the employment sphere; they are shaped by gender stereotypes within the household but they also operate at State, market and institutional levels (Kabeer, 1994a; Goetz, 1995b). Women's engagement in science and technology (including energy) should go beyond providing women with only material gains (e.g. by providing lighting or an income) to question how women can be better integrated in order to challenge pre-established roles and responsibilities and to contribute to their autonomy and empowerment. There is potential for an interconnection between empowerment and entrepreneurship in that, empowered women can adventure in entrepreneurship in the rural energy technology job market, and employment opportunities in this field can lead to entrepreneurship. Questions that

arises from this discussion are whether development programmes are suited to facilitate transformation, and what tools are available to them to support women's elaboration of their own strategic empowerment agenda.

3.3.2 Energy training as a tool to boost women's entrepreneurship

What are the linkages between training in energy technology by NGOs and rural women's entrepreneurship in the energy job market? Debates in GED and women's empowerment literature on this topic are relevant to the case study of Solar Mamas, as will become evident in Chapters 5 and 6. By critically assessing such a programme, it may be possible to determine whether and how rural women can play a leading role within their communities as energy entrepreneurs. I also explore the extent to which entrepreneurship in the energy technology field can support rural women's transformative empowerment by challenging socio-cultural customs and traditions.

As I discussed in Chapter 1, many rural women in remote areas of India suffer from the lack of energy services because, due to their roles and responsibilities within the household, they are in charge of fuel procurement. This activity often implies walking long distances and transporting heavy logs; additionally, they are more exposed to the fumes deriving from the use of unsustainable energy sources than men (Clancy et al. 2004; 2012; Standal, 2016). Energy service provision could contribute to off-grid communities beyond the provision of light, to education for the children, health benefits, and job opportunities for women within and outside the household (Cecelski, 2003; Kooijman et al., 2018). However, the lack of female role models in communities reinforces traditional customs and emphasises women's marginalisation from training and the labour market (ibid.). Batliwala and Reddy point out that:

> [i]t is necessary therefore to recognise the transformative potential of energy in its two critical dimensions: as a resource for improving the quality of life

(for providing lighting, cooking fuel, pumping water closer to the user, etc.); and as an essential resource for productive, income generating work that could raise incomes and standards of living" (2003:42).

In addition, Clancy et al. (2012) claim another dimension of energy access, which is a strategic one. It seems that this dimension raises a few concerns. Although there is evidence of a correlation between energy (availability, access, consumption, benefits deriving from it) and changes in people's lives; their causality is not easily proved since there are other elements that need to be in place in order to contribute to people's life transformation (ibid.). For instance, access to electricity per se cannot generate business development (Kooijman-van Dijk, 2009 cited in, Clancy et al., 2012). Nevertheless, energy can be seen as a resource for education and awareness raising; through energy training programmes other aspects of women's life can be positively impacted such as, for instance, participation in decision-making, raising consciousness, increased mobility, and women's active engagement in challenging socio-cultural constraints. Therefore, awareness raising and training are essential to achieve this kind of transformation (ibid.). Batliwala and Reddy, (2003) comment that, while there is evidence of cases in which leadership by poor women in, for instance, water and sanitation, health, and other programmes has supported achieving greater results and with less corruption, energy programmes see women as passive beneficiaries of services rather than entrepreneurs and managers.[57] They suggest that challenging the practice of planners and activists could contribute to achieving a shift for women from beneficiaries to entrepreneurs (ibid.). Once actively participating in energy programmes, women will not only attain better control and improve the quality of their lives, but also there will be a shift "[f]rom energy for women [,] the process will

[57] See Batliwala and Reddy (2003:41), for reference to successful development programmes led by women. See Dutta et al. (2017), for women's energy entrepreneurship programmes from ENERGIA and partner organisations and institutions.

lead to the empowerment of women. This is the challenge" (Batliwala and Reddy, 2003:41). Similarly, Dutta et al. (2017), claim that women's energy entrepreneurship can contribute to development goals such as gender equality and women's empowerment (SDG5) and sustainable energy access for all (SDG7). Clancy et al. (2002) confirm these assertions by reporting on the improved cookstove programme of Sarin (1984) in India run by local women. It has been successful since women can approach other women; they are not impinged by social constraints; also, they best relate to local energy needs and can identify required services. They argue that "[w]omen may in fact be ideal candidates to become energy entrepreneurs…[t]his may in fact be the best route to greater women's participation in energy choice" (Clancy et al. 2002:19). Clancy et al. (2002), also point out how the focus on household energy is shifting since it is not about cooking solely. On this point, they further stress:

> energy entrepreneurship could extend beyond stoves to include energy services, for example the supply of, and even the repair of, modern energy appliances such as solar panels. There is an enormous need for agents in rural areas who can distribute such equipment on a commercial basis, albeit with some support in the short term (2002:19).

Several authors argue that women's participation in technology training is essential to boost their employment opportunities and leadership (Cecelski, 2000a; 2000b; Batliwala and Reddy, 2003; Panjwani and Cecelski, 2003; Cecelski, 2004; Clancy and Dutta, 2005; Karlsson, 2007). However, as previously discussed, cultural, attitudinal, financial, locational and mobility barriers, among others, prevent them from participating in the job market arena (Deshpande and Sethi, 2009; Goyal and Parkash, 2011; Datta and Gailey, 2012). This is especially true in poor rural areas where, "[f]or example, social taboos and cultural sanctions have been described as almost

insuperable in parts of India" (Evans, 1995:10; Dhar et al., 2018). Key questions arise from the Platform for Action of the Fourth World Conference on Women (1995) on the ways in which women could be empowered by enhancing their skills, knowledge, and access to technology and training. What efforts, if any, have been made to encourage and enable women to gain access to technical knowledge, and by whom (UN, 1995)? Training in energy services potentially benefits rural women and their community in different ways. It can support fighting their marginalisation, acquiring entrepreneurial skills, engaging with the community and providing energy in otherwise off-grid areas. In addition, it can be argued that, since women are particularly sensitive to other women's issues and better understand their domestic roles and responsibilities, they can relate to each other more easily and act as champions for other women in their communities. Therefore, women's engagement in energy training and service provision, has the potential to, not only contribute to their 'effective' empowerment and to that of other women (by being able to carry out their given roles and responsibilities more efficiently), but also their 'transformative' empowerment by reframing their roles and responsibilities and becoming active agents of change.[58]

In a webinar organised by the International Network on Gender and Energy (ENERGIA, 2016) Sergina Loncle from 'Wonder Women' in Indonesia describes how their programme on solar energy contributed to transforming rural women's perception and reality from being victims of energy poverty to become active actors in driving forward clean energy solutions. She comments:

> women have a vital role in expanding energy access and creating a cleaner, healthier and safer environment for themselves and for their family, community and for future generations (ibid.).

[58] For a discussion on 'effective' versus 'transformative' agency, see Kabeer (2003) and Chapter 2, section 2.4.2.2.

In the same vein, Olasimbo Sojinrin from the ‘Solar Sisters' programme in Africa, in the same webinar, emphasises how energy poverty is a gender issue because it affects women and men differently (ibid.). The benefits of solar light for women go beyond providing lighting since they can be the solution to eradicating energy poverty by becoming energy entrepreneurs (ibid). Similarly, Ellis discusses the ‘Construction and Use of Alternative Technologies' project in Guyana:

> [t]his involved training for local women in the design, construction and use of appropriate technologies related to energy saving. Through this programme, Ellis states, women were exposed to the domain of science and technology in situ, developed relevant skills and were better able to understand the links between science, technology and their everyday lives (1990 cited in Evans, 1995:9).

According to the Human Development Index (HDI, 2015) report:

> [s]everal countries in South Asia have demonstrated that such work [in energy technology] is a viable option for women, which allows them to balance work with family care responsibilities. Renewable energy also stimulates small enterprises such as lantern rentals, phone and battery recharging, and so on (UNDP, 2015:143).

Nevertheless, greater transformation, which is not only financial, requires breaking down gendered role and responsibilities. Other benefits affect the environment and children’s education with the reduction of CO_2 emissions thanks to the replacement of kerosene-based lamps, and longer studying hours for children

(ibid.). Additionally, training and skills development, technical know-how innovation transfer and financial schemes could contribute to more broadly spread these positive impacts (ibid.). As Batliwala and Reddy point out:

> [e]xperience is mounting to confirm that the decisions of women take into account the long-term and the next generation, a natural consequence of their linkage with children. They are prepared to sacrifice immediate gains for long-term benefits… It is precisely such a view that leads to sustainability. Hence, women are naturally endowed to be the implementers of sustainable development (2003:40).

It is important to highlight that these considerations and processes can be relevant as long as they empower women without leading to their instrumentalisation. Cecelski observes, “energy products are particularly associated with technological knowledge, and are a valuable commodity, and hence high status, that would not be found in e.g. handicrafts” (2004:61). Hence, while contributing to the community and gaining their respect, an outcome of women's participation in energy technology transfer projects and programmes could be enhancing their status. Therefore, one of the questions that arises, and that I explore in the next chapters, is the extent to which such programmes also challenge, rather than reinforce, the gendered division of labour and what their scalability is in light of global development goals.

3.4 Summary

The literature reviewed in this chapter suggests that popular education programmes by development oriented NGOs, such as training and other informal education activities, can support overcoming rural women’s social, institutional and political constraints on their lives by contributing to their consciousness-raising and

agency (Cecelski 2000a; 2000b; Batliwala and Reddy, 2003; Panjwani and Cecelski, 2003; Clancy, 2003; Cecelski 2004; Clancy et al., 2004; Clancy and Dutta 2005; Karlsson, 2007). Like empowerment, consciousness-raising is a process that emphasises the need for disenfranchised groups to act towards challenging structures and transforming their realities (Cornwall, 2016). Although it might be true that due to traditional constraints, such as religion, caste, class, and status, some marginalised women might not know an alternative to their oppression, GED literature has challenged this vision of women as victims. It highlights that there is a call for female role models to address women's marginalisation at a local level and female victimisation at the global level (Clancy et at., 1999; Clancy, 2002; Kooijman et al., 2018). Notwithstanding the debates on the role of NGOs in development, perhaps, they can better understand and address community's issues because they are closer to the community (ibid.). Increased participation and decision making of rural women and educational programmes are often at the core of NGOs agenda towards women's empowerment (Feldman, 1997). However, it is important to question the extent to which they can support marginalised groups to achieve greater transformative empowerment in consideration that patriarchal and other socially constructed inequalities such as religion, caste, class, status, and sex constrain poor women in rural north India (including Rajasthan) and limit their human, social, and economic development (Das, 2008; Gupta, 2009). Contextualisation in time and space is key.

Women's alienation from training is particularly evident in relation to technology and science because these are fields that have been reserved for men. Technical skills and spheres of expertise are gendered due to socio-cultural assumptions and customs. While women have been associated with basket making and men with hunting, boys with computer hacking, and girls with emoticons, women are associated with softer skills while men have been coupled with technology (MacKenzie, 1991; Miller and Durndell, 2004 cited in, Bray, 2013). Both, gender and technology are socially

constructed, therefore, the affinity between the latter and masculinity is embedded, as Bray discusses:

> into everyday experiences of gender, historical narratives, employment practices, education, the design of new technologies, and the distribution of power across a global society in which technology is seen as the driving force of progress (2013:370).

Much of the available evidence leads to the conclusion that engendering knowledge networks and technology transfer could facilitate the exchange of knowledge and practice, and encourage women's informed and active participation in areas that are of their interest; therefore contributing to their 'transformative' empowerment (Panjwani and Cecelski, 2003; UNDP, 2004; Dutta et al., 2017; Feenstra and Özerol, 2018). Women's engagement in energy training is an innovative approach of grassroots organisations to provide women with skills, income, and awareness, among other benefits, to be able to bring about change in their lives. NGO programmes, such as the Solar Mamas, often focus at the village-level and are tailored to satisfy local priorities and needs, therefore they might be best suited to challenge institutional and traditional norms (Bertaux and Crable, 2007). Engagement of marginalised women in rural energy technology programmes can be a pathway towards their 'transformative' empowerment.

Chapter 4 Research methodology and design

4.0 Introduction

In this chapter, I outline and justify how I conducted the case study of the Solar Mamas' programme with reference to the theoretical concepts set out in the literature review. I also discuss how my methodological approach influenced the choice of the research design, methods of data collection and analysis of the findings. In section 4.1, I begin by presenting the feminist methodology that informs my thesis and that is based on the conceptualisation of social realities as multiple and dynamic. Since women's empowerment traditionally follows a bottom-up approach, the adoption of a feminist constructivist epistemological approach brings to light new questions that arise from people's experiences and insights, and that inform theory and practice (Hesse-Bieber and Leavy, 2007). I also discuss ethical considerations including issues of positionality and reflexivity when conducting the research, and the challenges that I encountered in carrying out this study. I then outline the research design and discuss the methods deployed to collect the data and I explain the approach that I adopted for the analysis of the findings.

I invited the Barefoot College Solar Mamas' programme to participate as a case study because the College has been providing energy training to illiterate and semi-literate women for over 20 years. The organisation is a well-established NGO operating in remote areas that are characterised by significant marginalisation of women. Their programme supports the development of rural communities and has the potential to contribute to the empowerment of rural women through skills and knowledge transfer, and by encouraging income generation.

4.1 Feminist methodology

My methodological approach informed my choice of research design and data gathering. Fig. 5 illustrates this approach, the research design, the methods I adopted for the collection and the analysis of the data.

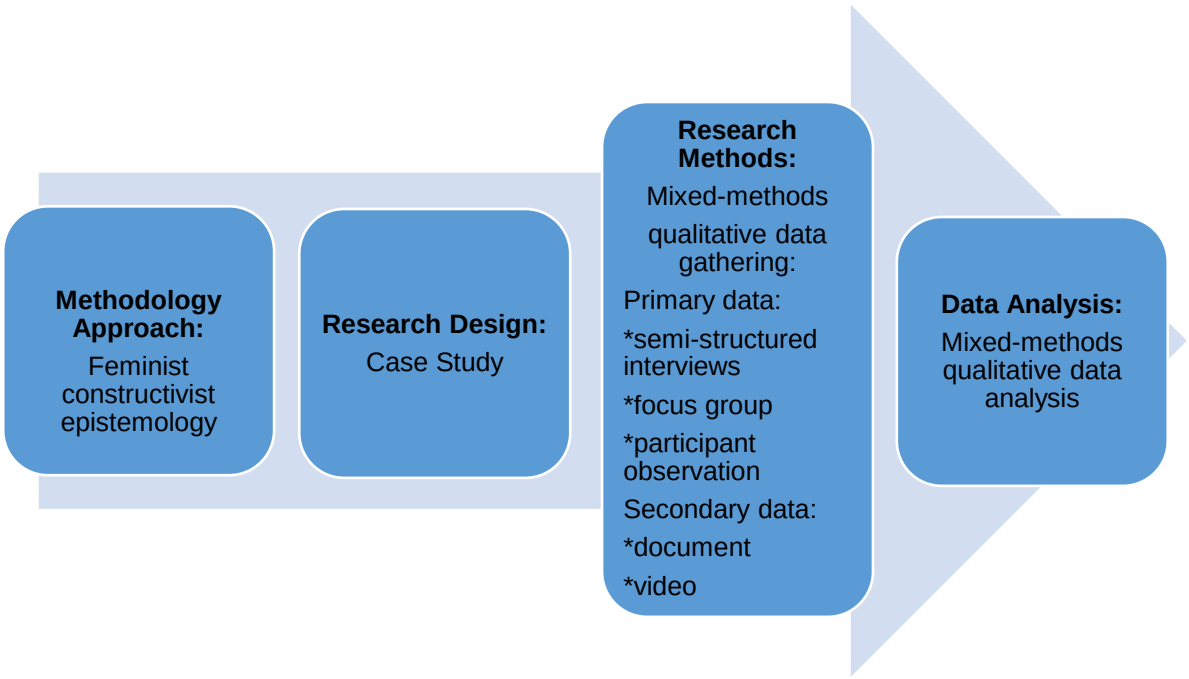

Fig. 5 Research methodology design and data analysis

4.1.1 Feminist approach

I adopt a feminist constructivist epistemology whereby socially constructed categories, including class, caste, status, gender, and religion shape how people perceive realities (Guba and Lincoln, 1994). I recognise that there is not one 'reality' but multiple 'realities' that are fashioned by individuals; my own subjectivities, emotions, beliefs and so on, are key to and blended into the research process (Campbell and Wasco, 2000). As Stanley and Wise point out "objectivity", used to measure social knowledge, can be seen as "an excuse for a power relationship" (1983:167 cited in, Westmarland, 2001). Therefore, in order to avoid such an

approach, I have been conscious that in the research process, “in knowing other people, a knower’s subjectivity is produced and reproduced” (Code, 2013:38). Becker et al. (2012) suggest that social traditions and values shape culture; culture developed from the pastm outlines people’s lives, and is an ongoing process that continues into the future. Although the culture, customs and other external factors, including socio-economic conditions, have an impact on poor rural communities in affecting their lives, I am aware that these realities are neither independent from human actions nor are static, but are in a process of continuous shaping and reshaping by the actors involved (ibid). In recognising that individual and collective actions can challenge social structure, my research emphasises the interrelation between agency and structure (Giddens, 1982). This flexibility and reflexivity to the ever-changing social dynamics combines well with the theoretical assumptions of empowerment as a continuous, evolving process, explored in Chapter 2. The constructivist paradigm allows bridging theoretical approaches of women’s empowerment, together with the practice on the ground, by investigating how local women’s experiences and lessons can affirm or challenge the theory. As Hesse-Bieber and Leavy (2007) state, building knowledge from women’s accounts and experiences is essential to feminist research. In order to understand the multifaceted realities of rural women in remote areas of Rajasthan, I engaged with the participants in this study, questioned and listened with an open and enquiring mind, in an active and continuous process of reflection and interpretation (Robson, 2002). During this process, I adopted a reflexive approach to address my personal biases in interpreting and analysing the research findings in the discussion chapters.

By conceptualising power relations and by recognising that they operate at multiple levels within the society, feminist epistemologies have allowed a deep analysis of women’s daily practices and experiences. My aim is to explore the practical, productive and strategic interests of the rural women partaking in the Solar Mamas’

programme not only in consideration of their gender, but also in relation to their status, class, age, and caste, since these are interconnected within multiple constraints. As Alcoff and Potter (2013:1) highlight, “many feminist epistemologists [are] skeptic[al] about the possibility of a general or universal account of the nature and limits to knowledge … that ignores the social context and the status of the knowers”. Therefore, I recognise that while in Rajasthan patriarchal norms are prevalent, participants’ experience might challenge or contrast the dominant culture. Feminist epistemologies, as conceptualised by Haraway (1988), focus on ‘situated knowledge’ that is shaped by experience and differences, and that is context specific and constantly evolving. Adopting this approach has enabled me to go beyond the mere description of observations and interviews to explore and understand the underlying causes of rural women’s marginalisation and the constraints on their empowerment in remote areas of Rajasthan, as feminist research practice suggests (e.g., Haraway, 1988; Harding, 1991; Hesse-Biber, 2012). In particular, my constructivist approach allows me to bridge issues of women’s marginalisation and disempowerment with energy technology training in order to respond to my research question.

4.1.2 Ethical approach and challenges

A critical aspect of the research process in social sciences regards its ethics in light of context-specific ethical dilemmas. This thesis originates from my personal and professional experience while working for a NGO in Rajasthan before starting my PhD. During the time spent in Udaipur and the surrounding rural area, I became familiar with the issues related to the lack of a regular electricity service in urban areas, and to the total absence of it in the rural ones. When traveling in off-grid areas I faced the daily struggles that rural villagers, and especially women, confront due to the dearth of energy services. Temperatures in the summer can reach up to 45° Celsius and the lack of fans, cooling systems, refrigeration and so on, negatively impact the running of

vital services and infrastructures such as hospitals, health centres, schools, water pumps, and functions critical to their survival. My interest in sustainable development since my MSc studies led me to search for opportunities to explore the complexity of the interconnections between energy access, women's lives and their empowerment in the context of rural off-grid areas. This PhD research allows me to pursue in greater depth key debates and challenges in the women's empowerment, energy technology, and international development. The existence of social inequality and injustice in relation to the access to reliable energy systems and services, and of forms of structural discrimination against women in regards to access to resources, including energy, compelled me to initiate this research. Although having worked and lived in Rajasthan and having traveled extensively in India before, as a western feminist researcher, I found myself overwhelmed when faced with the multifaceted fabrics of the Indian culture permeated by local customs and norms. I observed high levels of poverty and the lack of infrastructure that exacerbate the living conditions in rural areas more than in urban contexts. In the areas nearby the Barefoot College, people often live in kutcha huts or mud houses with one to two rooms for the whole household, as shown in Figure 6.[59] In contrast to this scenario, the organisation has two campus areas where there are buildings that are used as offices, as houses for those living on site, and to host visitors and volunteers. Figures 7 and 8 show respectively an aerial of the new campus and the guesthouse in the new campus.[60] Both campuses represent a hub and an oasis for the locals living in poor conditions and in such remote areas. They offer basic amenities, services and infrastructure, including energy provision, water and sanitation, a health centre, a library, a communication centre, two canteens, and a crèche.

[59] I took this picture as part of my fieldwork observation in August 2015.
[60] Fig. 7 is part of the BC archive that I accessed during my fieldwork. I took the photo in Fig. 8 as part of my fieldwork observations in August 2015.

Fig. 6 Local rural houses in the Ajmer district area (photo: Fieldwork)

Fig. 7 Aerial of the Barefoot College new campus (photo: Barefoot College)

Fig. 8 Guesthouse in the new campus (photo: Fieldwork)

During my fieldwork, I humbly and respectfully dived into the complexity of the social customs that shape and constrain rural women's daily practices. In order to carry out my fieldwork, I stayed on the Barefoot College campus and I received the support of NGO professionals. Living on campus, and the help received, were extremely important in my experience of uncovering and understanding intersectional power relations, and how these affect women's behaviour in light of the multiple identities they inhabit. The NGO was extremely cooperative and supportive in facilitating the research process.

I can describe my experience as dual: on the one hand, although being a woman, I felt that the women I engaged with perceived me as a privileged white western educated 'outsider'.[61] On the other hand, living on campus I also felt that it was my duty and my pleasure to partake and contribute in the community's activities. This supported building rapport with the campus community and changed my perceptions in that I sensed stronger integration and recognition by the local women. I recognise that a feminist ethnographic approach would have perhaps allowed stronger relationship with those women from the local communities affected by the SMs' programme and the SEs who went back to their villages. By residing alsongside the SEs, I would have been able to understand deeply women's energy every day practices and needs and the SEs' needs and interests. As Naples suggests, "ethnographers negotiate and renegotiate relationships with the members of the communities they study through particular and ongoing everyday interactions" (2003:4). However, logistic, safety and time issues represented constraints on residency within the communities affected by the SMs' programme. These communities live in small hamlets scattered in rural areas; therefore, I would have had to move from one hamlet to the other. In order to spend some time in these areas, I often stayed in the NGOs field centres and visited them during the day. Additionally, most of the SEs I interviewed were not anymore working as SEs, therefore I would have not been able to observe their work and daily practices as SEs. On the other hand, by living on campus, I was able to create rapport with the STs and the SCEs who work and live there and with the SEs who attended the training. In this way, I observed their work, their daily lives and negotiated relationships with them.

[61] Several authors, such as Mohanty et al., have criticised some western feminists' postcolonial approaches to research that tended to ""colonize" the constructive complexities which characterize the lives of women in these countries. It is in this process of discursive homogeneization and systematization of the oppression of women [in the global south] that power is exercised in much of recent Western feminist discourse […]" (1991:54). As I explain in this section, I am aware of issues of priviledge and positionality due to the colonial legacy in India.

The dichotomy insider/outsider is a key debate in feminist research and is constructed by the interpretation and understanding that the researcher and the person 'researched' have of "the complex social and political processes evident in specific contexts" (Naples, 2003:8). Agarwal (1994a) raises similar considerations when she talks about the positionality of privileged western feminists researchers exploring social inequalities and injustice in the global south. She claims that "[i]t is not easy to build links with the underprivileged from a position of privilege. Yet building these links is critical" (Agarwal, 1994a:253). In particular, Agarwal emphasises the importance of "build[ing] these links across class and caste lines, and between feminist theory and practice" (ibid.). In a similar vein, Batliwala (2015) reports that sometimes there can be problems of interpretation concerning the understanding of what represents women's issues. She mentions how western interpretations of reality shaped her perception of what constitutes women's issues. For instance, she claims that women's issues in rural communities are often community issues themselves (ibid.). In one of her studies, she explains how local women referred to domestic violence and harassment rates as community issues, while energy, water, food and shelter were identified as women's issues (ibid.).

With this awareness, I recognise the challenges of my positionality insider/outsider, and by my personal bias in conducting this research as both, a researcher, and as a former NGO worker. As a feminist researcher, I aimed to lessen the hierchical relationship with the participants in my study, as I discuss further in section 4.2, by adopting an approach of mutual respect and relationship, seeking to gain and share knowledge (England, 1994). Due to my former role in NGOs, to ensure independence of judgement, and in order to avoid misinterpretation in reading and analysing the findings, I listened to the interviewees' accounts and I reviewed my field notes with an open mind. I acknowledge that the research process is a "two-way relationship between ideas and evidence [...] ideas are what lead you to search for

particular kinds of evidence, but the evidence may lead you to change your ideas" (Thomas et al., 1998:13). Additionally, as Hesse-Biber and Leavy (2007) suggest, being an outsider has also encouraged me to question what is assumed to be 'shared knowledge' in order to get a unique perspective from the interviewee on a specific topic or issue.

Conscious of these considerations, I chose the design of my study and the methods of data gathering. To ensure the transparency and the reliability of the research process, I often made use of the triangulation of the data by comparing the evidence gathered (Hesse-Biber and Leavy, 2007).[62] I also followed the guidelines and the regulations established by the Ethical Review Panel of my University. Thus, the collection of the data embraced ethical principles such as reporting the findings fully and truthfully, respecting the privacy of the individuals interviewed, maintaining a strict confidentiality and seeking the individuals' consent (Burnham et al., 2008). Therefore, since I am accountable to the research participants, I ensured an ethical process, respecting and protecting them from harm (Robson, 2002; O'Reilly, 2012). In doing so, I negotiated access to information. When I contacted the NGOs and explained my research aims and scope, I sought their consent to participate in my study; they agreed to disclose their name. Likewise, prior to agreeing to be interviewed, all participants were informed about my research aims and scope, and were given a consent form that was translated in Hindi. For those who could not read it, translators interpreted the form verbally in the local language. Those invited to engage in my research were given the choice whether or not to participate in the study, to interrupt the interview at any time, and to skip any questions, if they felt uneasy. I guaranteed the anonymity of the women interviewed, while professionals of the Barefoot College and of partner organisations, speaking as 'key informants', agreed to disclose their names and that of the organisations they represent. They also gave consent to attribute

[62] I discuss data triangulation in section 4.1.3.1.

quotations to them. Additionally, I asked for a verbal consent when taking pictures and when recording the interviews.[63] The College also allowed me to access their documents, videos and pictures archives and to use them in this study.

Given the language barriers, I relied on local translators. One of the challenges that researchers face when working in other countries is meeting respondents with a different native language from the researcher. Studies have shown how language has an impact on the way people respond to questions according to their cultural values (Harzing, 2005). Hence, there is the risk of meaning getting lost during the translation (Van Nes et al., 2010). This is especially significant in qualitative research that centres around words (ibid.). On this note, as I mentioned in Chapter 2 (section 2.2), when translating the term 'empowerment' in Marwari, the local language, linguistic issues arose because it is not used informally. As Luttrell et al. (2007) indicate it appears that the term has different connotations in different languages; thus, there is the danger of 'empowerment' to be used as a buzzword in international development programmes, as Batliwala (2015) points out. I recognise how the the translation process constrained my understanding of the participants' responses. I am also aware of how this, consequently, influenced my findings. This is a critical dilemma in qualitative analysis (Temple and Yound, 2004; Van Nes et al., 2010). Therefore, prior to starting the interview, I discussed with the translators the context and intended meaning of the questions and I selected the approapriate wording with them (ibid.). In order to follow the conversation between the translator and the interviewee, I learnt some basic and key words in Hindi. Additionally, due to the British colonial legacy, participants often use English words. Due to location constraints, and to the difficulty in finding someone that could work as a translator for the duration of my fieldwork, I relied on seven translators. Six were either professionals of the NGO or volunteers; one was hired at a local professional rate, and conducted the majority of the interviews. Due to transport

[63] All photos in this thesis are included with permission of people in the photos.

constraints, two representatives of the organisation acted as translators during the focus groups.

4.1.3 Research Design: case study

The research design represents a framework or strategy that leads the collection and analysis of data through the research methods (De Vaus, 2001; Bryman, 2012). I have adopted a case study research design for this thesis since it allows an in-depth investigation of specific issues in real-life sites over a certain period (Stake, 1995; Hakim, 1987; Yin, 2003). The case study approach enables me to "capture the circumstances and conditions of an everyday or common place situation", to "examine theoretical and empirical deliberations in a particular research site" and to unveil key social processes (Yin, 2003; Bryman, 2008:56). This approach is particularly relevant to two of my thesis objectives: evaluating the extent to which and in what ways training on energy technology supports the empowerment of rural women in Rajasthan; and drawing lessons from the analysis of the findings to inform theory and practice in the gender and energy field. Both, a case study approach and qualitative research enabled me to gather insights from specific localities and contexts and the accounts of daily life. I have chosen qualitative research because there is a tradition in feminist development research of exploring women's everyday lives and social inequalities through case studies and qualitative analysis (e.g. Rocheleau et al, 1996; Chopra and Müller, 2016). The open-ended nature of the enquiry provided the opportunity to voice the experiences and practices of the rural Rajasthani women participating in Solar Mamas' programme of the Barefoot College and to identify their shared or contrasting individualities. The qualitative approach has enabled me to explore differences among groups of people acting in the same social context in regards to their practices and behaviours, and to grasp the personal meaning and motivations attributed to those (De Vaus, 2001; Lincoln and Denzin, 2003).

4.1.3.1 Study limitations: data validity and reliability

Limitations of this research strategy relate to the validity in terms of the generalisability of the outcomes, and their reliability due to the small sample. Because of the latter, it might be difficult to make inferences in relation to the broader population (Yin, 2003; Crouch and McKenzie, 2006). On the other hand, there is scope for further research. Additionally, Denscombe suggests that:

> there may be insights to be gained from looking at the individual case that can have wider implications and importantly that would not have come to light through the use of a research strategy that tried to cover a large number of instances- the survey strategy" (2014:55).

He emphasises that "[t]he aim is to illuminate the general from the particular" (2014:54). In-depth interviews with a small sample size enable greater personal reflection and narration (Crouch and McKenzie, 2006). I have used this research strategy to strengthen or challenge the theoretical perspectives explored in real-life at the grassroots level (Denscombe, 2014).

According to Bryman, validity "refers to the issue of how we can be sure that a measure really does reflect the concept to which it is supposed to be referring" (2003:29). Franklin et al. suggest that reliability indicates:

> the degree to which other researchers performing similar observations in the field and analysis such as reading field notes transcribed from narrative data would generate similar interpretations and results (2010:356).

Hence, reliability relates to the replicability and consistency of the findings. Yin (1994), comments that often those who are critical of case study design remark that researchers might not adopt sufficienly efficient series of measures to ensure validity. In terms of the reliability, this can present particular challenges in qualitative research since the analytical process can be biased by the researcher's own perceptions and interpretation of participants' accounts (Ritchie et al., 2013).

In order to increase validity, as Yin (1994:34) suggests, I recurred to the use of "*multiple sources of evidence*" as I explore in the next sections. The research methods that I adopted ensure that the recording of the data is precise and that "the interpretations are empirical, logical and replicable" (e.g., in Chapters 5 and 6, I explain each theme and subtheme that I refer to from literature or that emerged during the fieldwork, and whether and how they interrelate) (Franklin et al., 2010:355). Other methods that I adopted are purposive sampling and triangulation techniques. Through my sample, I have been able to show important and emergent insights (Reason and Rowan, 1981, cited in Franklin et al, 2010). Moreover, some findings are replicated in the accounts of different participants and locations (Miles and Huberman, 1994, cited in Franklin et al, 2010).

To ensure the reliability of my findings, I provide an account of my approach to data gathering and analysis; this includes the criteria I adopted to select the participants, methods of analysis, interview topic guide and a narrarive of the researcher's role, as I discuss in the next sections (Frannklin et al., 2010). Additionally, the adoption of a mixed methods approach, combined with the triangulation of data and reference to similar or contrasting cases, further strengthen the reliability of the findings (Patton, 1999; Robinson, 1999; Flick, 2018). A combination of methods or a crosschecking technique known as triangulation is frequently used in qualitative research to seek trustworthiness and to provide complementary data that can strengthen the findings (Creswell, 2003; Burnham et al., 2008; Bhattacherjee,

2012). Both data triangulation (using different data sources e.g. interviewing different actors) and methodological triangulation (using different methods, e.g. interviews and focus group discussion) has also contributed to ensure the validity and the reliability of the data collected (Patton, 1999; Robinson, 1999).

4.2 Methods of data collection and analysis

In order to collect the data, I adopted a mixed methods feminist approach. I choose methods consistent with my concern to lessen the "hierarchical relationship" between the participants in my study and me, to encourage confidence, to become aware of, and take into considerations women's emotions (Campbell and Wasco, 2000; Hesse-Biber and Leavy, 2007). I have done so by capturing the participants' accounts of their lived practices and experiences. As Greene et al. explain, advantages of using a mixed methods approach lie in the:

> complementarity, [which] seeks […] illustration, [and] clarification of the results from one method with the results from the other[;] initiation, [which] seeks the discovery of paradox and contradiction [; and] expansion, [which] seeks to extend the breadth and range of inquiry by using different methods for different inquiry components (1989:259).

To develop an in depth picture of the Solar Mamas' programme, I used: i) semi-structured interviews; ii) focus groups; iii) participant observation; iv) document and video analysis. I discuss these methods in the following sections.

4.2.1 Semi-structured interviews

Interviews are widely used in qualitative research because they offer the opportunity to give voice to otherwise marginalised voices (Bryman, 2008). Semi-

structured interviews are extensively used in feminist research since they support "emotional closeness to the persons studied" (Jayaratne, 1983:145 cited in Jayaratne and Stewart, 1991). Although I had a set of pre-established questions (see Appendices A and B) this method provided the time for the interviewees to emphasise issues, or enrich their accounts on topics that were particularly relevant to them. Additionally, when they felt uneasy, participants omitted to reply.[64] I considered it important to ensure that the interviewees felt comfortable and confident when answering the questions; thus, not all the women replied to all the questions. As Oakley (1981) notes, in feminist research, semi-structured interviews attempt to actively engage the interviewee in the research process by encouraging reflection. This reflexive process also provides insights into an individuals' point of view (Bryman, 2008).

Through the interviews, I facilitated an in-depth discussion to disclose women's perceptions of their empowerment, and professionals' opinions on the solar programme. Personal, face-to-face interviews allowed me to understand better the interviewees' feelings and opinions, and to build knowledge from women's accounts and experiences (Burnham et al., 2008; Bhattacherjee, 2012). I had to tweak my set of questions when new data emerged from the interviews, from my obsevations, and while informally talking to the participants in the SMs' programme (e.g. concerning the creation of the society). I conducted in depth semi-structured interviews with the women engaged in the solar programme, and with representatives from the College and partner organisations.[65] Due to transport and climate-related constraints, I conducted five interviews by phone. As mentioned in section 4.1.2, in the empirical Chapters 5 and 6 I gave women participants' pseudonyms in respect of the code of practice that prescribes protecting vulnerable groups. However, professionals of the NGOs, due to their position agreed to reveal their names.

[64] Appendices A and B are respectively, a topic guide of the interview with the solar engineers, and a topic guide of the interviewees with representatives of the BC.
[65] I discuss the case study sample in detail in section 4.2.5.

4.2.2 Focus groups

The focus group is a valuable method for ensuring the triangulation of the data since participants can bring into light relevant aspects that might not be explored through a questionnaire or an individual interview (Kitzinger, 1994; Bryman, 2008; Punch, 2014). It is a qualitative research method, which involves several participants to discuss particular topics or issues (Kitzinger, 1994). One of the main advantages of this method is that it involves interaction among participants and with the facilitator, therefore providing additional insights that would be more difficult to access in one-to-one interviews (Wilkinson, 1998). While the researcher acts as a facilitator and observes the group dynamics, participants might challenge each other's views (Kitzinger, 1994). This method has been widely used in feminist research since it allows participants to connect and share their experiences and practices while, perhaps, reducing the hierarchy between the researcher and the participants in the study (Wilkinson, 1998; Wilkinson and Silverman, 2004). I supplemented the semi-structured interviews with two focus group discussions. The first, engaged eight local women using the solar PV system installed by the engineers, and a representative of a partner organisation acted as a translator. The second, involved two women living on campus that were using the solar cookers, and a NGO representative acted as a translator. One of the challenges of researching in countries where a different language is spoken from that of the researcher is having to rely on translators, as explained in section 4.1.2. During the focus group with the local women that were using Solar Home Systems (SHS), the translation was not simultaneous since often women talked at the same time. Therefore, it was difficult to gauge whether they had individual insights. Approximately five participants were more engaged in the discussion, and one acted as a representative of the group. When conducting the focus groups with women living on campus and using solar cookers only two women were available. This is an example

of how the goals of a researcher do not always align with participants' real-life conditions and needs.

4.2.3 Participant observation

As Bryman points out, participant observation is a very-well known method of social research, it:

> entails the relatively prolonged immersion of the observer in the social setting in which she or he seeks to observe the behaviour of members of that setting (group, organization, community, etc.) (2012:270).

Spending three months on campus and traveling in the surrounding area allowed me to immerse myself in the Barefoot College community life, in the local life, and to understand in depth the context and the social dynamics. Integration in such processes is critical for the observer to explore, educe and attribute meaning (Musante and DeWalt, 2010; ibid.). As Merriam (2002) claims, this research method is the best for uncovering findings that are not directly disclosed using other methods, such as interviews. Participant observation entails learning from the involvement with the participants' daily routines in the research context (Schensul et al., 1999). Reflecting on people's attitudes, non-verbal behaviour (for instance, facial expressions and gestures), the informal jargon, and engaging in community activities and events, not only enriched but also allowed me to triangulate the information acquired with other methods (Marshall and Rossman, 2014; Spradley, 2016). Musante and DeWalt emphasise how this is an "iterative process…part of what occurs in the development of a tacit understanding of meanings, events and contexts by the researcher" (2010:158). By engaging with the community, I was also able to create rapport with the interviewees; feminist research considers this as key (Campbell and Wasco, 2000). I

observed the day-to-day participants' behaviour and practices, their relationships and interactions. I found the use of this method critical to my understanding of power relations, context specific constraints on women's empowerment, and women's daily practices and needs in relation to energy. The recording of notes, thoughts, photographs, drawings, places, and conversations that I gathered in the field diary, are part of the observation, as Cook (2005) notes.

4.2.4 Document and video analysis

I complemented the primary data collection with secondary data by reviewing reports from international development agencies, as well as documents, reports and videos available through the Barefoot College archive. I accompanied these with the pictures and the information published on the organisation website. Secondary data gathering has been useful for the triangulation of the findings after undertaking the interviews and the focus groups and supported informing my questions during the interviews (Bryman, 2016).

4.2.5 Research participants

In this section, I describe the selection process of the participants. I used purposive sampling either because of the position they hold, or because of the particular or unique contribution they could make. I consulted with the Barefoot College professionals about relevant 'informants' on campus and from partner organisations (Denscombe, 2010; Ritchie et al., 2013). They suggested partner organisations that operate locally that I could contact for my study. Since Rajasthan is the biggest state in India, due to transport, climate (starting of the monsoon season) and time constraints, I focused my research in three of the five districts the NGO engages with, and close to the NGO base in Tilonia, Ajmer. Figure 9 shows a map with the selected districts.

The NGO also provided me with a list of women who participated in the solar programme in the past years.

Fig. 9 Map of selected Districts in Rajasthan

I take into consideration time as a dimension that influences, together with space, the empowerment process of the rural women engaged in the solar programme of the Barefoot College. I selected the women participating in this research in consideration of the year in which they undertook the training; as such, most of the interviewees started the training between five to ten years prior to my fieldwork (between 2000 and 2010). In this way, I have been able to determine whether and how the participation in the programme contributed to progressive changes in women's lives; I have done this in consideration of empowerment as an ongoing process. Among

the participant in the programme, I selected a sample of women based on their location (where they lived and/or worked) and depending on how easy it was to contact them. Although I initially planned only one field visit for time and financial reasons, because of constraints dictated by the climate, transport in remote areas, and the lack of a translator in the first three weeks, I also made a second field trip.[66] In the second trip, I interviewed two NGO representatives and I conducted two focus groups. The first phase of my fieldwork lasted seven weeks between July and August 2015, and second phase lasted three weeks between November and December 2015. While at the College, I identified six sets of interviewees: i) representatives of the College and three other partner organisations suggested by the NGO, that operate nearby the College ii) the solar trainees that became solar teachers within the Barefoot College, iii) the solar trainees that became solar engineers and went back to their villages, iv) the solar cookers engineers; v) the new trainees that just joined the training at the time of the fieldwork, vi) and women who had been trained to use the solar cookers (solar cooker workers).

Table 2 shows the case study participants. I contacted three local organisations based in this areas in addition to the BC, and I interviewed 32 rural women who have engaged with them and their representatives.

[66] I discuss the challenges of the study in section 4.1.2. I conducted my PhD part-time, therefore, since I worked at the university, I organised the first field trip during the summer of 2015 when there are no planned academic activities. Since I did not have funds provided for my research in Rajasthan, I had to search for grants; therefore, I also planned the fieldwork in conjunction with the availability of those.

Table 2. Case study participants

Interviews Participants	Number
NGO representatives	
Bhagwat Nandan, Solar Programme Coordinator of the Barefoot College	1
Ramka Ram -Coordinator of the Women's Empowerment and Rights programme	1
Teja Ram- Director of Manthan, Kotri, Ajmer&Nagaur	1
Don Ras- Coordinator of Prayatna Sansthan, Solawta, Jaipur	1
Mota Ram, Director of Social Action for Rural Advancement (SARA), Sikar	1
Solar Mamas- Solar Programme	
Solar Teachers	8
Solar Engineers	13
New Trainees	3
Solar Mamas- Solar Cookers Programme	
Solar Cookers Engineers	6
Solar Cookers Workers	2
	TOT 37
Focus Groups participants	
Village women	8
Solar cookers users on campus	2

The number of interviewees depended on the fieldwork time and resources I had available and on the availability of the interviewees, as explained above. I interviewed the representatives of the NGOs in this order: Bhagwat Nandan, Solar Programme Coordinator of the Barefoot College; Ramka Ram, Coordinator of the

Women's Empowerment and Rights programme of the College; Teja Ram, Director of Manthan (Ajmer-Nagaur Districts); Don Ras, Coordinator of Prayatna Sansthan (Jaipur District); Mota Ram, Director of Social Action for Rural Advancement (SARA) (Sikar District). The last two I interviewed in the second field trip. I interviewed Bhagwat Nandan first because of his role as Solar Programme Coordinator and because he was the first person to be trained as solar engineer. Having been engaged in the programme for a long time, he and could provide me with specific insights on the programme. I interviewed the other representatives of the NGOs according to their availability. As I explain in the next section, within the sets of women who participated in my study, I distinguish three main sets: the solar teachers (STs), the solar engineers (SEs), and the solar cookers engineers (SCEs). The participation in the solar training programme differently affected these groups of women interviewed.

4.2.5.1 The Solar Mamas

In addition to the three main sets of participants described before, I also interviewed the new trainees and the solar cookers workers, as I explained in section 4.2.5. The selected women were usually illiterate or semi-literate, and belonged to different castes and religions. Therefore, their class and status varied. Their engagement in the solar programme has differently affected them in terms of their empowerment. After the training, some of the engineers became solar teachers to train other women. Their position presents several benefits including: living on campus or in nearby areas (living and working in an environment that is safe, and that is characterised by a philosophy of egalitarian and no-hierarchical modus vivendi, participating in the NGO life, and the exposure to the international women's programme); integration in the rural energy job market; being up-to-date with current technology innovation adopted by the college; continuity of their salary. After the six-month training in Tilonia, the solar engineers leave the campus and return to their

villages to install small-scale solar PV systems. These are able to provide electricity for two Compact Fluorescent Lightbulbs (CFLs) of 10 Watts each (due to frequent energy faults, it is not possible to have a higher voltage), which are installed one inside and the other outside the household, and to charge a mobile phone. The local organisations mentioned in the previous section, partners of the College, support the engineers that I interviewed. With the payment fees, the organisations pay the engineers' salary. The amount received is not the same for all the engineers depending on how many solar panels they look after, and on the partner organisation they are involved with. Usually, their salary is around 1.500-2000 INR a month.[67] The engineers are responsible for the maintenance of the panels; for this function, the community is meant to provide a space for a rural workshop. In order to record the maintenance process, the engineers also learnt how to keep a register of their interventions. The life span of the panels is of about 25 years; therefore, there is usually little maintenance to carry out. Operations include repairing the solar panels when they are damaged, technology upgrade, which happens on average every two to three years, or changing the battery every five to seven years. In addition to those who trained in previous years, I also interviewed new trainees (NTs) from Rajasthan who were undertaking the training at the time of my fieldwork. Figures 10 and 11 respectively show solar engineers engaged in a class learning about electric circuits in the training centre of the new campus, and three women charging solar lamps with a panel.[68]

[67] The average minimum wage salary in 2015 is INR 5670 per month.
[68] I took the photo in Fig.11 as part of my fieldwork observations in November 2015.

Fig. 10 Training class with the solar engineers (photo: Barefoot College)

Fig. 11 Solar Mamas charging solar lamps (photo: Fieldwork)

The solar cooker engineers, like the STs, either live on campus, or in nearby villages; therefore, they benefit from the same advantages explored above. The SCEs received different training and gained specific skills regarding the building and the functioning of the parabolic solar cookers (see a sample in Figure 12 below). As part of the training, “the engineers learnt many technical skills such as operation and functioning of the mechanical pendulum clocks, different kinds of solar cookers and how to use more than 50 different tools” (Kakani, 2014). In addition, they also “learnt about complex concepts such as latitude and location and how to weld and assemble 300 mirrors” (ibid.).

Fig. 12 Parabolic solar cookers (photo: Barefoot College)

The interviewees participated in the design of the cookers, therefore adapting it to their needs. As an outcome of the training and the engagement with the NGO, some of the engineers set up the Women Barefoot Solar Cooker Engineers Society (WBSCES) in 2006; this is the first registered solar cookers society set up and run by illiterate and semi-literate women in India (Kakani, 2014). Kakani (2014) reports that,

"[b]y managing the society, women also learnt many entrepreneurial skills such as accountancy, management, purchasing, sales and budgeting". In order to acquire those skills and to run the society, the SCEs have to face many challenges and infringe local customs as I explore in the following chapters.

4.2.6 Data analysis

In line with feminist qualitative data analysis conventions, I transcribed the content of the audio-recorded interviews and focus groups to ensure transparency and reliability (Gibbs, 2002; Caudle, 2004; Hesse-Biber and Leavy, 2007; Burnham et al., 2008; Yin, 2011; Yin, 2015). Memos and field notes that I took during the fieldwork accompanied these. When reviewing and listening to the interviews, I identified key themes of concepts and categories, or patterns, and sub-themes in the data. I clustered, classified and interconnected those in order to uncover key issues and develop conclusions (Charmaz, 1983; Hesse-Biber and Leavy, 2011). This is a technique used in qualitative data analysis, which eases the categorisation process of data for interpretation (ibid.; Dey, 2003). Critical themes in literature on women's empowerment, and gender, energy and development are: access to and control of resources (material, including employment and income generation; human, including education, autonomy and use of time; social, including participation in decision-making, engagement in networks and mobility); the safety, health and wellbeing of women and girls that, due to gendered role and responsibilities suffer the most the consequences of the lack of energy amenities, as explored in previous chapters. Some of these themes are intersectional in that they affect multiple aspects of women's lives (e.g. autonomy is conceptualised not only as financial independence, but also as personal in terms of the ability to make their own choices, as explored in Chapter 2).[69]

[69] See Fig. 3 in Chapter 2.

The themes that are embedded in my analysis are either interrelated with, or they are challenging, or contributing new insight and perspectives to those discussed in my conceptual framework. They emerge from my interaction with the respondents during the interviews, and from the interplay between women's accounts and my reflections on the concepts explored in my conceptual framework. In addition, some of the themes that became evident in the analysis are interconnected because they influence several spheres of the interviewees' lives. I identify some as main themes, while others as sub themes. I do not discuss the themes in a hierarchical order because they reflect women's own individualities and priorities, and because all the themes show multiple aspects of women's empowerment process.

During the analysis I gave priority to the interviews and the focus groups discussions compared to other data because, as Brooks discusses, "[w]omen's concrete experiences provide the starting point from which to build knowledge [...] in order to achieve an accurate and authentic understanding of what life is for women today" (2007:56). The evaluation of the focus groups added an extra layer to the analysis compared to the interviews since the group discussions have allowed me to observe the interaction between the women interviewed, the positions they took within the group, and the arguments raised. The observations that I recorded in the fieldwork diary further supported the understanding and the triangulation of the data collected, as Kitzinger (1994) and Patton (1999) suggest.

As explained in the Introduction and in Chapter 2, it is argued that the intersection of multiple factors, including status, age, religion, and gender, constrain many women's empowerment, their position and condition in the society. When analysing the findings, I indicated the participants' age, and their status, whether they were mothers-in law (ML), daughters-in-law (DL), and living without in-laws (no IL).

Some participants also voiced whether their religion and caste influenced choices and behaviours.[70]

I carried out the analysis of the findings using Nvivo. Although it is the role of the researcher to interpret and conceptualise the data, the analysis of data through these kinds of software may ensure more transparency of the findings and may force the researcher to be more explicit and reflexive about the process of analysis (Lee and Fielding, 1991; Bryman, 2008 cited in, Punch, 2014). Nvivo11 allows the association of codes, and I found this useful to make and uncover connections between codes, and to link the findings from the interviews, field notes and focus group discussions (Weaver and Atkinson, 1995).

4.3 The Barefoot College: organisation profile

I selected the Barefoot College because the socio-cultural, geographical and political context of rural Rajasthan provides an interesting location to study women's empowerment through energy and because the organisation has been involved in community development for over forty years. There is indication that interconnection of class, caste, status and gender, in this geographical area, present significant constraints on women's empowerment. For instance, while in some northeastern areas of India, where there is a tradition of matrilineal and bilateral inheritance of land, women have rights such as freedom of movement, social participation, and ownership of resources (e.g. land), in the northwest, they are restrained in different ways by the patrilineal system (Agarwal, 1997a; Desai and Temsah, 2014; Roy, 2015). In this context, Sangari (1995, cited in Lingam, 2007) talks about the synergy of 'multiple patriarchies'. These originate from the caste division, religious pluralism, familial

[70] Among the participants, there are seven ML and only three live with their DL. Of the other four, one has daughers so she has sons-in law, of another her sons and DsL live far, the other two did not mention whether the DsL were living with them. Of those who live on campus (4STs and 5SCTs), one SCE is a DL and and one ST is a ML and they live with their extended family.

systems (patrilineal and matrilineal), and so on, and operate differently within regional histories. As Lingam (2007) comments, these 'patriarchies' are also gendered and entrenched within social institutions such as the family, the community, the State, and the market. Similarly, Kalpagam (2019:17) asserts that 'multiple patriarchies' are not only intersected, but also "mutually constituted, formed, and transformed within national and transnational […] processes". I add that in the Indian context they also differ among State and regional socio-cultural and political spatialities. Classe, caste, religious, and familial status all influence the distribution of social power and material resources, and women's position and condition within and outside the household (Kalpagam, 2019).[71]

Some scholars, such as Chandhoke (1995); Dhanraj et al. (2002); Batliwala and Dhanraj (2004); Das (2008); Kilby (2011), emphasise that women's subordination is further exacerbated by the Hindu religious fundamentalism (Hindutva) that is contrasting equality and freedom and restating gender roles. Batliwala and Dhanraj write, "[r]eligious fundamentalism and neo-liberal economic reforms are converting poor grassroots women in India into both agents and instruments in a process of their own disempowerment" (2004:11). This socio-political context, in addition to rooted traditions based on caste, religion and status that dictate customary rules among the society in rural Rajasthan, especially weakens women's capacity to challenge the constraints on their empowerment (Bidner and Eswaran, 2015; Jain, 2016). Moved by poverty concerns in rural India, Bunker Roy invited a group of young professionals to look for alternative ways to address water and sanitation, electricity, education, health and communication issues (Barefoot College, 2015b; 2015e). Having found an abandoned tuberculosis sanitarium, Roy and his team came up with the idea of

[71] My analysis in Chapters 5 and 6 takes into consideration these differences. Some participants' accounts reveal whether and how their religion, caste, gender, position or condition within their family and the broader community influences their status and power relations.

converting it into a Social Works and Research Centre (SWRC) to work strictly with the villagers (Roy, 2011; Barefoot College, 2015b). Roy and Hartigan (2008) report that the realisation of their project involved a number of challenges: for instance, in order to go ahead with their ideas, they confronted local traditions and customs that saw the rich landowners in power, and that were shaped by a hierarchical system infused with corruption. In 1986, the organisation expanded and they built the new campus, with the support of rural women architects, encouraging equality, and emphasising the importance of local knowledge and skills (Barefoot College, 2012; Shining Hope Foundation, 2014).

I venture to say that the campus represents a co-operative model of space sharing and, as Cecelski suggests, “a legitimate public space” where women can form their ideas and opinions, and develop professionally, personally, and socially (2004:61). Swidler, talking about culture and the role of institutions in shaping it, asserts that “institutions structure culture by systematically patterning channels for social action”, “they create […] structures that are both constraints and opportunities for individuals (1995:39, 36). I would add that, an individuals’ process of constructing and deconstructing social spaces shapes collective culture. The Barefoot College campus is characterised by a collective, democratic egalitarian and non-hierarchical model of working and living that enriches people’s lives; there are no gender, religious, status, caste and so on biases. The innovative aspect of the College is that of a crossroad amidst transient communities and those who live and work there. Therefore, it is a place where were women can start their cognitive and psychological empowerment and where they access a physical space to question inequalities and reinvent themselves as individuals while creating a collective identity, goals and actions. This becomes the physical and the social place where women from all over the world encounter, share experiences and knowledge, and start their conscientisation process.

In regards to their energy programme, the NGO developed an innovative training model. The 'Barefoot Model', has been successful in transferring solar engineering skills, and has been replicated in over 90 countries of the global south. The training model transfers solar engineering skills to rural illiterate and semi-literate women and centres on a bottom-up approach that develops from indigenous knowledge and community engagement (Barefoot College, 2015a). Following the philosophy of the College that challenges conventional educational systems, the engineers do not receive any certificate at the end of the training but recognition as Women Barefoot Solar Engineers (WBSEs), and they are provided with a manual (Barefoot College, 2015d). As Roy (2011) emphasises, certificates, literacy and even speaking the same language are not necessary to become a solar engineer. Technology innovations cannot be just given to rural communities; they need preparation, understanding of it, acceptance, and ownership of it. Therefore, training not only to maintain but also to build the technology is essential, and rural women have an important role to perform (Roy and Joshi, 2005). The 'Barefoot Model' focuses on "educating local people through peer-to-learning[; it] is transformational in that it relies on the passing on of traditional skills and knowledge" rather than depending on outsiders to introduce new approaches (Barefoot College, 2012). Figure 13 offers an example of peer-to-peer knowledge transfer by a solar teacher using a tablet while engaging with an international solar engineer.[72]

[72] I took this photo as part of my observations during my fieldwork in August 2015.

Fig. 13 Solar teacher during a training with the international Solar Mamas (photo: Fieldwork)

The training provides rural women with the skills to develop their own communities; in this way, “they will be able to electrify their villages and become role models in those” (SHF, 2014). According to the founder, “[t]he model has taken into account the pace at which people think, the culture, which is respected, and the capacity… of the community to adjust to, apply and to disseminate ideas”; “that’ s what scalability is all about. It’s a model that people understand; it’s not complicated. It respects the skills that people have rather than discarding them or replacing them” (Barefoot College, 2012). Based in Tilonia, the organisation has two campuses where local people engaged with the NGO, live and work. The old campus is connected to the electricity grid and solar panels, while the new campus is solar electrified and connected to the gas pipe. They are located at a walking distance from each other. The old campus holds a training workshop where the solar teachers operate the international

programme, and where the international women live with some other local members. The new campus hosts a training workshop, the offices of the Solar Unit, and the training centre to run the Indian programme. Here, the solar trainees live during the training with the NGO community members.

4.3.1 Case Study: The Solar Mamas' programme

After a preliminary desk-based study of projects and programmes on energy and development with a strong women's engagement, I chose the SMs' programme because of the specificity of the socio-cultural context Rajasthan that particularly inhibit their social, human and economic development and empowerment (O'Reilly, 2006; Pankaj and Tankha, 2010; Duflo, 2011; Singh and Kumud, 2013). In addition, as explained in Chapter 1, there are remote areas, such as in the Ajmer, Jaipur, Nagaur and Sikar Districts, which are partially covered by energy services including the electricity grid and gas pipes. As previously investigated, due to gendered roles and responsibilities that see women marginalised in the domestic arena, they are particularly affected by fuel scarcity, and by the use of unsustainable energy sources (Parikh and Laxmi, 2000; Laxmi et al., 2003).

In order to select the case study, I conducted a review of the academic literature and of international development reports that focused on the work of the College energy programme. I also consulted reports, videos and documents available on their website. From this review, and from the information and observations that I gathered during my fieldwork, and recorded in my field diary, I was able to compile a detailed account of the history, philosophy work and aims of the NGO and of its Solar Mamas' programme. My case study is unique in that, there is no other study that provides a holistic, in depth analysis of the SMs' programme and situates it in the socio-cultural and political context of rural Rajasthan.

The SMs' programme focuses on training illiterate and semiliterate rural women

on the building, operation, and maintenance of small-scale energy photovoltaic (PV) home systems, solar cookers and solar lanterns. There are three different programmes within the SMs: the solar engineers, the solar cookers engineers, and the solar engineers international.[73] The NGO organises two on-site six-month training per year where women from different Indian states gather to live and train on campus. Since my research focuses on Rajasthan, I selected only Rajasthani women. The training programme is funded by the Ministry of New and Renewable Energy of the Indian Central Government under the Indian Technical and Economic Cooperation Programme (ITEC) and covers the salary of the teachers and a salary for the new trainees who join the programme. During the training, the trainees receive INR 3000 per month. The solar teachers' salary is based on the Indian minimum wage of 5670 INR per month.[74] Figure 14 shows the training centre of the old campus.

[73] For the international programme selected women from different countries in the global south travel to the Barefoot College to live and train on campus for six months. Since my thesis is focused on Rajasthan, the analysis of the international programme goes beyond the scope of this thesis.
[74]This data is based on the rate operating in 2015.

Fig. 14 Solar centre old campus (photo: Barefoot College)

The selection of the future SMs happens after professionals of the Barefoot College or its partners complete a village survey to verify whether the area is or not electrified or close to the grid. Criteria for the selection of the villages also includes a minimum number of households (Barefoot College, 2015d). After a visit by the College representative to explain the solar initiative, the communities themselves or the College usually, select two women (ibid). The College uses music and puppetry to communicate, advocate, and educate rural communities on the advantages of solar energy, emphasising its long-lasting benefits also for the local environment, including that the panels can ensure lighting for over 25 years (the life span of the panels is around this amount of time) (Fieldwork diary). The benefits of the programme in terms of local sustainable development are highlighted by the CEO of the organisation when she says:

> [t]he power of the sun not only fuels a village but serves as a catalyst to create employment, boost income, reduce carbon emissions, save trees, and most importantly, to provide self-reliant solutions within village communities (Amplifier Strategies, 2016).

The solar programme also contributes to broader sustainability goals since it promotes social equality and inclusion especially of otherwise marginalised rural women living in areas of extreme poverty that face strong socio-cultural challenges. The programme partially responds to the energy demands of remote communities by providing lighting, solar energy for cooking, positively affecting the environment, and by reducing the impact from the CO_2 emissions produced by combustion of unsustainable energy sources.

As part of the agreement for the installation of the panels, the elders of the community form a Village Energy and Environment Committee (VEEC) with women and men members that will support the solar programme, collect funds from each participant household and offer a workshop space, the Rural Electronic Workshop (REW), where the engineers can operate (Barefoot College, 2015c). The United Nations Development Programme (UNDP), Save the Children (UK), the Swedish International Development Agency (SIDA), among others, sponsor the panels (Fieldwork diary). As mentioned in the Annual Report 2014-2015 "[t]he College is known for its ability to bring about policy change through partnerships with National Governments, Private Sector and Philanthropic investment" (Barefoot College, 2015a:27).

Each household contributes financially to the programme by paying about 3000 INR either in a lump sum or through monthly installments for three years (Barefoot College, 2015c). It is the College philosophy to ensure that the communities fully participate in the programme therefore owning and feeling responsible for the panels.

Additionally, the villagers' contributions ensure the sustainability of the programme (ibid). The aims of the programme are: to contribute to the empowerment of rural women, and their income generation by transferring skills and engaging them in the design and operation of energy projects; to implement energy technology solutions in rural areas, and make sure that these are operated and maintained by the local communities; to "strong[ly] commit to developing women as agents of sustainable change"; and support "communities to develop their own capacity to meet the challenges within the developing world" (Beri, 2011; Oparaocha and Dutta, 2011; Roy, 2011; Mohideen, 2012; 2013; Rojas et al., 2012; Santos, 2012; Elkington and Hartigan, 2013; Practical Action, 2013; Barefoot College, 2015b:1; 2015c). Through the engagement in the programme, the organisation offers training and income generation opportunities to illiterate or semi-literate, unemployed and marginalised women living in remote areas. The training style of the NGO follows a bottom-up approach, and is innovative in that it relies on indigenous knowledge and the engagement of local communities as I explained in the previous section. The founder, Bunker Roy, explains that the bottom-up approach supports the communities to gain confidence, and with this, they can "take major decisions regarding their own development and they take control, they manage and own the process" (SHF, 2014). Roy points out that the idea at the basis of their energy programme was:

> to bring out the knowledge, skills and wisdom of very ordinary people who have so much to give for their own development, and the Barefoot College is providing that space" (ibid.).

4.4 Summary

In this chapter, I discussed the methodological approach that underpins this thesis, and how this has informed my choice of study design, the methods of data gathering, and the analysis of the findings. I take a feminist constructivist approach that allows listening to people's voices and experiences in light of the evolving socio-cultural context in which they live. Producing knowledge from participants' accounts is key in feminist research (Hesse-Bieber and Leavy, 2007). This kind of epistemological approach is widely used in feminist research since it encourages trust, disclosure and celebrates the avoidance of a hierarchical relationship between the researcher and the participants in the study (Campbell and Wasco, 2000). The social constructive epistemological approach is embedded in my thesis since I have been actively reflecting, questioning and interpreting, the interviewees' accounts as suggested by Robson (2002).

I followed a tradition in feminist development research of adopting case study as research design because it enables an in-depth investigation of everyday, and evolving practices and processes (Rocheleau et al., 1996; De Vaus, 2001; Chopra and Müller, 2016). Feminist research commonly uses mixed-methods qualitative approach for the data collection because it facilitates going beyond pure observation and transcription of the interviews allowing reflexivity, triangulation and interpretation of the findings (Hesse-Biber, 2012). I carried out a case study of the Solar Mamas' programme of the Barefoot College for rural women's empowerment through training in energy technology, because this programme has been running for over 20 years. The NGO philosophy celebrates an egalitarian modus vivendi and promotes mutual learning, as previously discussed.

In order to analyse the findings I used the Computer-assisted Qualitative Data Analysis Software (CAQDAS) Nvivo since it ensures the transparency of findings, and eases the association of codes, field notes, transcriptions, and so on, on the basis of

the themes that I identified (Kitzinger, 1994; Weaver and Atkinson, 1995). In the next chapters, I analyse the findings of my two-phase fieldwork at the Barefoot College in 2015. The analysis is based on the theoretical and analytical conceptualisations explored in previous chapters to investigate the extent to which, and how, the engagement in the Solar Mamas' programme has facilitated the empowerment of the rural women that have participated in it.

Chapter 5. Does access to energy empower women? Findings from the Solar Mamas' programme

5.0 Introduction

Several papers in literature on energy and development in India claim that, due to the high cost of the grid expansion, small-scale decentralised energy solutions (for example SHSs) could address energy poverty concerns in rural areas (Buragohain, 2012a; 2012b; Aklin et al., 2016; 2018).[75] As explored in the Introduction, there are some areas of rural Rajasthan that lack access to modern energy; therefore, people depend on unsustainable energy sources including animal dung, kerosene and firewood (Udayakumar, 2016; ibid.). This has detrimental consequences for their health and for the environment due to the production of CO_2 emissions and for local forests management (ibid.). As my findings also suggest, there are instances in which women and children in particular suffer because of gendered roles and responsibilities that confine them in the domestic sphere (Baruah, 2015).

It appears that there is limited empirical analysis of the nexus between energy access and women's empowerment at the household level (Danielsen, 2012; Koojman et al., 2018). My thesis seeks to fill this gap with lessons from the Barefoot College Solar Mamas' programme. My qualitative case study of the Solar Mamas programme enables me to answer: What are women's struggles and constraints on their empowerment due to the lack of energy access? Can, accessing energy in their households lead to their empowerment? What kind of empowerment is it possible? In this chapter, I apply and mobilise my conceptual framework, developed in Chapter 2, to assess whether and how access to energy contributes to the achievement of women's practical, productive and strategic interests and needs. I also evaluate if

[75] The analysis of technology solutions goes beyond the scopes of this thesis that focuses of the social aspects of energy poverty.

access to energy (SHSs and solar cookers) contributes to women's 'effective' and 'transformative' empowerment. Central to this evaluation is Kabeer's distinction between women's effective and transformative agency where the former refers to "women's greater efficiency in carrying out their given role and responsibilities", and the later to women's ability to question, challenge and reframe those roles and responsibilities", (2003:174). 'Effective' and 'transformative' use of agency can respectively facilitate 'effective' and 'transformative' empowerment, a distinction that maps onto the practical-strategic gender interests dualism that has been influential in gender and development scholarship for decades (Moser and Levy, 1986).

This chapter has four main sections: in the first, I discuss the accounts of the SMs I interviewed; in the second, I discuss those of the SMs and the women who took part in two focus groups; in the third, I then discuss the implication of the solar cookers programme for the participants and local communities; and in the fourth, I discuss the BC and partner organisations professionals' views on how the SMs' programme facilitates the empowerment of the participants, the challenges that the programme is facing, and the solutions that the NGOs are adopting.

5.1 Solar Mamas' accounts of energy practices

In the following sections, I discuss key themes that emerged from my interaction with the interviewees and from my reflections on their accounts and the conceptual framework. I selected these themes because some are tied in with my framework; they align with those discussed, challenge them, or add new insights and perspectives from the Solar Mamas' accounts and experiences of their daily energy practices. Other themes emerged during the interviews or as part of my observations during my fieldwork. As discussed in Chapter 4 I do not discuss them in a hierarchical order as they all reflect the empowerment process of the participants in different ways and to different extents. In Chapter 4, I also explained that because of the intersectional

approach of this study, in the analysis of the findings I indicate women's status (ML/DL) and their age. Some participants also revealed their caste and religion during the interviews, commenting on how these influence their position and condition in their household and community. Figure 15 shows critical themes embedded in my analysis: 'decision making on energy provision', 'health and wellbeing', 'time management', 'choice of energy sources', and 'cooking practices'. The figure also shows themes that emerged as part of my analysis: 'cooking customs', 'environmental awareness' and SMs' expertise in rural energy technology'. The figure shows the intersection of themes and the identification of sub themes.

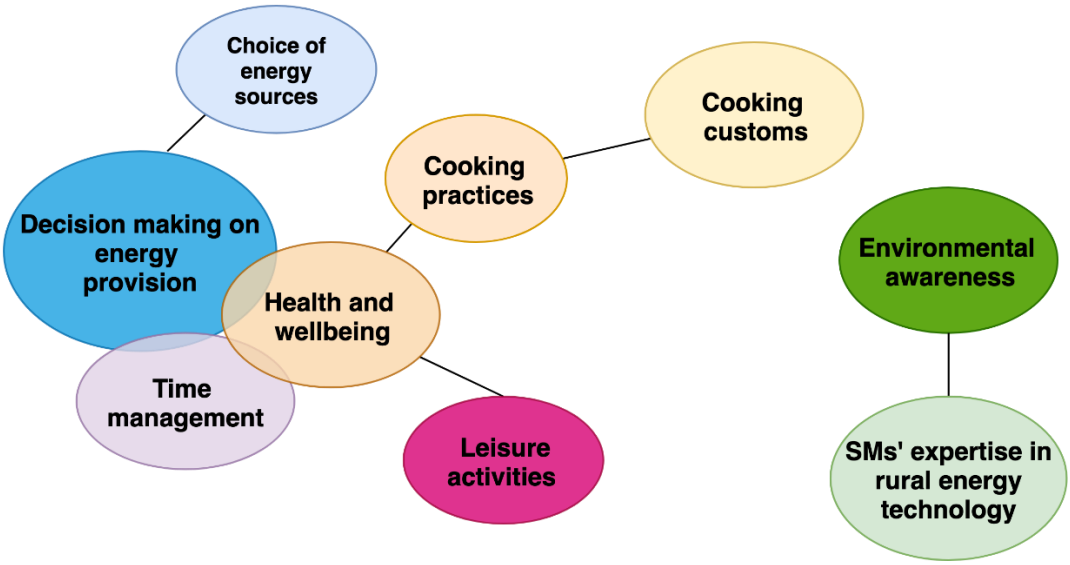

Fig. 15 Solar Mamas' accounts of energy practices

5.1.1 Participants' decision making on energy provision

In this section, I discuss the participants' decision making regarding the use of energy at household level because participation in decisions implies potential for women's transformative agency in challenging intrahousehold power dynamics (Kabeer, 2012; 2017). As shown in Fig. 15 my findings suggest that deciding on the use of energy sources influences the participants and their families' wellbeing (e.g. using clean energy positively affects their health), and the time they spend doing the

chores. Therefore, ‘decision making’ intersects with ‘health and wellbeing’, and ‘time management’. Participation in decisions directly influences the ‘choice of energy sources’, which I classify as a sub theme.

My analysis brings specific insights in that it highlights that different benefits derive from energy provision depending on the kinds of energy sources available. My findings show discrepancies among the groups of SMs that I interviewed. The accounts of women I interviewed suggest that only four out of eight who answered this question take decisions in regard to the use of energy sources, either alone or in consultation with their husbands.[76] Of these participants, two take decisions alone: one is 52, ML, and the other is 45 and she lives on campus. Of the other two who that take decisions with their husbands, one is 52, ML; the other is 30 and does not live with the in-law. Clearly, the absence on the in-laws, independently from their age, makes it easier for them to take decisions. For the other four (23, DL; 27, DL; 30, lives on campus; 20-40, DL), family members mostly take these kinds of decisions. For instance, Sameena (20-40, DL), one of the engineers, said, “my in laws take all the decisions regarding the household”. Similarly, Krisha (27, DL) commented, “other members in my family take these decisions”. These findings resonate with Cecelski (2004) and Köhlin et al.’s (2011) when they point out that men mostly decide upon the use of energy sources, services and appliances at home, while women’s view is undervalued. Cost and time saving are usually prioritised over women’s welfare (Cecelski, 2004). More empirical evidence in regard to the decision making process on the use of resources within households could support understanding intrahousehold dynamics and unveiling inequalities (ibid.; Clancy et al., 2012). Thus, although as Batliwala and Reddy (2003) point out, women and girls are the main energy managers within the household, “the choice of fuel is a gendered one that is determined by intra-household decision-

[76] See Chapter 4, section 4.2.5 for details on the case study participants.

making, the status of women as well as the value attached to women's labour" (Danielsen, 2012:10).

The STs and SCEs that live on campus are advantaged compared to the SEs who leave the campus after the training since they can access gas, firewood, electricity and solar energy depending on where they are based; both old and new campuses have solar light and or electricity, and the new campus has gas. In regards to the SEs, the respondents' accounts show that 11 out of 13 access electricity, ten use firewood for cooking, and only four have access to gas. I found differences among the participants groups because those STs and SCEs who work on campus access clean energy during working hours, and those who live there access it all day; as I discuss later this positively affects their health and the environment. I am not aware whether or not the Solar Mamas (SMs) living on campus participated in the decisions regarding the energy provision on site; nevertheless, my findings suggest that access to electricity, whether solar or not, and gas, has improved women's efficiency in carrying out their daily practices. For example, Gangi (35, lives on campus), a SCE, commented, "I use gas or the solar cooker, I don't want to waste time looking for fuelwood. It's difficult to find and it's also harmful". Similarly, Chandra (42, ML) commented: "it's good that you can make food with the energy of the sun and you don't need to use fuelwood". Fuelwood produces smoke that is very harmful for the health and these quotes highlight the engineers' awareness of the negative impacts of using firewood and their willingness to save time for other activities than fuel procurement (WHO, 2006). Three among nine STs and the SCEs live on campus, use either firewood or gas for cooking depending on where they live. However, I also found that at times, cultural bias on cooking practices and customs influence women's choice on adopting a specific kind of energy source (e.g. fuelwood versus gas), as I discuss further in section 5.1.2.

My analysis suggests that while access to energy contributed to greater

efficiency for women, and to their 'effective' empowerment, the lack of consultation in regards to the choice of energy sources emphasises a lack of decision making power. These findings, confirm Clancy et al.'s (2012) claim that access to energy per se does not imply transformation in the intrahousehold power dynamics and in women's participation in the decision making on the use of resources, although living without the in-laws makes it easier for the participants to decide alone. My analysis also shows that gendered roles and responsibilities have not been challenged as such. Perhaps, further action by the NGO requires developing a long-term strategy with the engagement of the community as a whole, to facilitate challenging these socially constructed rules that obstruct women's decision power in regards to the use of energy sources.

5.1.2 Participants' health and wellbeing

Another critical theme discussed in my conceptual framework is the 'health and wellbeing' that depends on the kinds of energy sources used. As previously discussed, the use of unsustainable energy sources such as kerosene and charcoal, particularly affect women and girls because of gendered roles and responsibilities for cooking and other house chores, as previously discussed (Batliwala and Reddy, 2003; Panjwani and Cecelski, 2003; WHO, 2006; Pinter et al., 2013; IEA et al., 2018). This is also the case for the engineers engaged in the SMs' programme, and my analysis shows specific features, as I discuss below, in relation to whether and how access to electricity for lighting facilitates the interviewees' engagement in activities in their free time, therefore contributing to their wellbeing.

Although some participants use biomass for cooking, the interviewees voiced that their health has improved because they access solar energy or electricity for lighting. In particular, 13 recognised that it is more comfortable to have lighting at home, 13 showed their awareness of the health impact of fumes on their lungs, and 18 on

their eyes. Pooja, a SE (25, DL), said that by using biomass, “food is not healthy, fumes are bad for the eyes, I have headache and I feel very bad”. Additionally, a teacher commented, “kerosene, charcoal, and wood, affect the lungs and can lead to tuberculosis. Also, the fumes affect the eyes” (Jaya, 52, ML). Overall, engagement in the SMs’ programme also increased participants’ knowledge of sanitation and hygiene, as some interviewees commented.

However, questions arise in regards to the relationship between access to energy and their overall wellbeing in terms of their free time; ‘leisure time’ is a sub theme as shown in Fig. 4. Important considerations arise from my analysis: if lighting is mainly used for women’s effective agency in order to attain what Kabeer (2001) refers to as ‘functioning achievements’ (including cooking and doing the house chores), what implications, if any, has access to energy for women’s leisure time to improve their wellbeing? Is energy, somehow, also used for strategic purposes, such as to broaden their views and perspectives (e.g. watching TV, listening to the radio, and reading)? These kinds of tools facilitate women’s exposure to information and entertainment, widen women’s horizons and contribute to their emotional and psychological wellbeing (Cecelski, 2006). As discussed in section 5.1.2, GED literature suggests that access to energy can free women’s time and that this time can be used in educational, recreational or income generation activities (e.g. Clancy et al., 2012). One interviewee (55, ML) commented that access to energy can “save women’s time”; however, my findings show discrepancies among the interviewees. In conversation with the participants, nine women watch TV (one is a widow; 45, lives on campus; 20-40, DL; 40, DL; 35, DL; 52, ML; 35, DL; 30, lives on campus; 50, ML and lives on campus) and five (30, no IL; 50, lives on campus; 20-40 DL; 52, ML; and 35, DL) listen to the radio in their free time. It does not appear that their age or status (ML versus DL) influenced their leisure time. For example, Rashmi (45, lives on campus), a SCE said, “when I am free I watch some TV with my family”. I also asked the interviewees what

kinds of programmes they watch on TV. Prisha (35, DL), a SE said, “I watch musicals and movies”; Nidhi (30, lives on campus), a ST, commented, “I watch the news”; Rashmi, added, ‘I watch TV series”, while Sameena (20-40, DL), a SE, commented, “I watch religious programmes”.

Six of the interviewees are engaged in educational activities such as reading (three STs: 30, no IL; 35, DL; and 30, lives on campus) and teaching their children (two SEs: 25, DL and 25, DL). Perhaps, their age influences their engagement in educational activities especially when the participants have school-age children. For instance, Divya, a ST (30, no IL) commented, “I go to English classes and help my children doing the homework”. Sameena (20-40, DL), an engineer said, “I have some free time. I spend some time with my children or I sew”. Eighteen interviewees can access a mobile phone, one of which bought it with her salary. Four interviewees (30, no IL; 35, DL; 20-40 DL; 50, ML) do some stitching and sewing or make bracelets. These findings show that access to energy facilitated some participants’ engagement in recreational or educational activities.

However, another group of respondents commented that either they do not have free time or that it is the same as before; three SEs (52, ML; 25, DL; 35, DL), four STs (35, DL; 50, lives on campus; 40, ML; and 27, lives on campus) and one SCE (42, lives on campus) said that they do not have free time. Three interviewees (30, DL; no age info, widow; 28, lives on campus) said that they work the same amount of hours than before. Two STs (52, ML; 30, no IL) and two SEs (27, DL; 30, DL) said that they had more free time earlier due to their work as engineers. Of these, two said that they did not mind though. In addition, a SCT said that although she is working more, she “never thought I would be an engineer so I’m happy” (Gangi, 35, lives on campus). Another (50, ML) said that she has more workload that before because of her engagement in the NGO life having to spend time with visitors. For instance, Jaya, a teacher, commented, “I have less free time than before being a solar engineer”. This quote, for

example, highlights that although Jaya gained the status of solar engineer in the public sphere, she does not have time for leisure activities in her private sphere; therefore, her personal wellbeing, in terms of 'free time' has not improved. This is an example of how findings can reveal contrasting outcomes in the public/private spheres. Shahana, another teacher, for example, said, "I have a daughter-in-law so I don't have to do the chores after work". Similarly, Vanya (50, ML), a SE, commented that she has four sons, so her daughters-in-law take care of everything. These quotes highlight how cultural customs are transmitted from a generation to another, and additionally stresses the perpetuation of gendered roles and responsibilities within the household. My analysis shows that there is evidence of energy access contributing to the respondents' strategic gender needs and interests by exposing them to other scenarios through reading and accessing communication tools. However, it is difficult to gauge what kinds of changes happened in the interviewees' family dynamics due to the introduction of such appliances, and whether women exercise empowerment agency due to this exposure.

5.1.2.1 Impact of solar light on cooking practices

There is extensive literature in India regarding the implications of clean energy cooking solutions in women's daily cooking practices (for instance; Funk, 2000; Ahmad, 2001; Ravilla et al., 2016; Nayek et al., 2017; Sharma et al., 2019). This is a fundamental theme embedded in my conceptual framework since the lack of energy services for cooking, particularly affects women and girls' health, more so than men and boys. This is due to their gendered roles and responsibilities that involve collecting and chopping fuelwood, and to local customs that see women and girls relying on secondary claims on food (Batra and Reio, 2016; Aurino, 2017). Addressing these asymmetries could contribute to greater gender equality, and to satisfying broader human nutritional needs. As shown in Fig. 15 I classify it as a sub theme of 'health and

wellbeing'; it emerged from my analysis.

My analysis suggests that cooking practices especially affect the time that women spend fetching fuel and shredding it; the time of the day in which they cook; and their health. I selected this theme because my analysis suggests, in addition, that local customs very much influence cooking practices, and that, at times, these can be difficult to challenge by a woman alone. Therefore, my findings confirm Agarwal (1994a) and Baruah's (2015) and claim that broader awareness at household and community level could generate 'transformative' change in cooking and eating habits.

When I asked about their cooking practices and the availability of energy services in their areas, the interviewees explained that, three of them buy firewood, three get it from their family farm, and fifteen go alone or with other family members to collect it in bulk so they can use it for a prolonged amount of time. For example, Saumya, an engineer (52, ML), said, "four or five people from my family go to fetch the fuel together and it takes about five hours". Similarly, Shwati, a teacher (35, DL), commented:

> [b]efore I used to collect firewood in the field while working. Now my family fetches it at once and then we stack it in our house so it's available to be used for six months.

These findings suggest that fuel collection, for some, is a family activity; thus, they seem to add on previous studies that claim this is a woman's responsibility (e.g., Laxmi et al., 2003). It seems that it is common practice in rural areas of the global south to store biomass even when modern energy services are available. The phenomenon of "fuel stacking" is due to different reasons including people' income, availability of fuel, safety and customs (Laxmi et al., 2003:66; Pachauri et al., 2004; Köhlin et al., 2011; Clemens et al., 2018). However, a ST commented that where she used to live before

moving on campus “firewood wasn't easily accessible. Fetching fuel was my main task during the day and it used to take me almost all day” (Divya, 30, no IL). Additionally, at times, although families buy fuelwood, part of women’s daily practices consists of shredding it. For example Sunita, a SE (40, widow, lives with the mother-in-law), said, “we [the family] buy fuelwood and I spend about half an hour to chop it”. Another commented, “I usually spend half an hour to collect it, break it and ignite it” (Pooja, 25, DL). It is interesting that, in areas served by electricity, it is used for lighting only rather than for cooking because it is expensive. Although some rural areas of Ajmer are more affected by the lack of energy facilities than others, 19 participants rated their energy service as good.[77] In particular, the interviewees also ranked the accessibility of firewood or gas for cooking as ‘very easy’ or ‘fairly easy’. Diya, a SE (30, DL), for instance, said:

> [t]he level of energy service in the area is good. There is electricity in the area, but in our household, we don't have the connection. When I need to charge my mobile, I go to my neighbour’s. We use a small *chullah* for heating and cooking with fuelwood that is easily available since we take it from the nearby farms.[78]

As this quote highlights, although the connection to the grid is nearby, not all the households are part of the network. It is not clear whether there is a selection process by the government, and on what criteria it is based. In addition, the participants use firewood or gas for cooking because most families cannot afford other electrical appliances such as electric cookers, refrigerators and fans. Similarly, Clancy et al.,

[77] Several energy programmes by the Rajasthan and the Indian central Government have been implemented in rural off-grid areas. The analysis of energy policy and programmes goes beyond the scope of my thesis; however, it would be interesting to explore the extent to which these interventions take into consideration gender and other social differences.
[78] The *chullah* is a small stove, used in rural areas, for cooking and heating.

(2002) and Dutta, (2003) report that usually, families that can afford to purchase electric appliances usually buy a TV and radio. This is also the case for the SMs since none of the interviewees uses electric cookers; however Saumya, a SE (52, ML), said, “with my salary I bought a mobile phone and a radio”.

Cooking customs

While I asked the participants about the kind of fuel used for cooking, it has been instructive to see how local customs and beliefs often influence the choice of fuel for cooking. This sub theme emerged from the participants’ accounts, and brings specific insights in relation to cooking practices. Cooking customs affect the participants’ health and wellbeing, and they also influence the adoption of cooking stoves. Studies show that the use of clean energy stoves can be undermined by these kinds of customs (Ravilla et al., 2016; Nayek et al., 2017; Sharma et al., 2019). My findings resonate with previous studies that discuss how embedded cooking customs and beliefs influence the choice of energy source for cooking, and that the taste of food is considered a priority over nutritional value (Ravilla et al., 2016; Khandelwal et al., 2017; Nayek et al., 2017 discuss similar findings). For example, a SCE said, “I mainly use gas, but for *chapatis* and other things I prefer using the fuelwood. I swap between gas and fuelwood according to availability” (Rashmi, 45, lives on campus).[79] A teacher added, “firewood is cheaper and easier to access and the food tastes better than cooked with gas” (Binita, 50, lives on campus). Although they have access to modern energy, some families prefer to continue to use biomass. This happens partly because of rural beliefs that cooking with gas makes people gassy, and that the food does not taste the same. An engineer said, “the village people have this misconception that food is tastier if cooked with the firewood” (Noor, 43, separated). However, one interviewee (30, DL) commented that cooking with biomass is unhealthy since the flame is uneven

[79] *Chapati* or *roti*, is a traditional flat bread.

and the food is, at times, uncooked.

My analysis suggests that women's choice in cooking is very much constrained by local customs and beliefs, which are not always the healthiest practices in terms of nutrition outcomes. Additionally, it can be difficult for a woman alone to challenge local customs. Perhaps women's choice concerning energy practices and sources within the household is also often constrained by the lack of decision making power, as previously discussed. Although energy access, for light and for cooking, eases women's daily practices, therefore contributing to their 'effective' empowerment, it is questionable whether this is challenging gendered roles and responsibilities. It is evident that the interviewees are still in charge of cooking and the related preparation activities (e.g. shredding and cutting fuelwood). Therefore, these findings highlight that due to gendered roles and customs within the household, women are especially affected by the lack of clean energy services. In particular, my findings highlight that daughters-in-law are in charge of preparation activities and it seems that younger generations are becoming more aware of the health implications of cooking with firewood.

5.1.3 Participants' awareness of environmental issues

I enquired as to interviewees' awareness of the environmental impact of the use of unsustainable energy sources and of the use of solar energy. This theme emerged as an outcome of my observations during my fieldwork. My analysis of the findings contributes new insights in GED and women's empowerment literature in the context of Rajasthan because it shows that participating in the training enriched respondents' knowledge specifically on rural energy technology. This helped the respondents to question their position and status within their household and community.

Although 14 out of 32 women interviewed said that they have not received specific information on the implications of using solar energy for the environment

during the training, 12 showed a level of awareness of environmental-related issues.[80] Shwati, a ST (35, DL), commented, “solar energy is durable”; Sonali, a SCE (28, lives on campus), said, “the sun is unlimited, it can affect the masses over all; wood is going to finish at some point”. This quote shows the engineer’s awareness that biomass is a limited resource. Similarly, another four participants (23, DL; 45, live on campus; 42, ML; and 50, no status info), recognised that using solar energy helps preserve woodland. For example, Amrita, a new trainee, said, “[g]etting firewood means cutting down trees. That's bad for the environment”. This shows the interviewees’ awareness that logging can be detrimental for the local environment. Other women also mentioned the environmental impact of the use of unsustainable energy sources; for example, Madhu, a SE (no info, widow, DL), said, “I am aware that kerosene and other fuels create lots of pollution problems. With solar energy there is less pollution”. Four interviewees, including a new trainee (23, DL; 45, lives on campus; 25, DL; no demographic info) are aware of the impact of smoke on the environment; a teacher (35, DL) and an engineer (no demographic info) acknowledged that solar energy does not harm the environment. Divya, a ST (30, no IL), has been told about recycling plastic and paper; thus, when mentioning the environment, she referred to recycling. Another teacher mentioned the importance of energy saving: “it is good not to waste the solar energy produced” (Binita, 50, lives on campus). Seven women (52, ML; 35, DL; 30, DL; 43, separated; 50, ML, lives on campus; no age info, DL; 50, no status info) are also aware that the climate influences the performance of the solar panels and cookers. They mentioned having problems during the monsoon season and when it is particularly cloudy. For instance, three engineers commented on the topic. Saumya

[80] I am aware that the organisation had the intention to include, after my fieldwork, also some training on the impact of solar energy on the environment as part of the Solar Mamas’ programme. More information, for instance, should be given in regards to the disposal of the batteries and its repercussions on the environment. It would be interesting to explore what has been done so far in this regard, and what are the implications for the empowerment of the women participating in the programme.

(52, ML) said, “when it's rainy or stormy the solar panel doesn't work”. Prisha (35, DL), commented on the functioning of the electronics during the monsoons, “[w]hen there is lots of rain the switches of the light for the solar panels fail and need to be fixed”. Noor (43, separated), said:

> [s]olar [energy] can be used only when there is the sun. It doesn't work when there are the monsoons; there can be some technical problems with the switch to get the light.

My analysis shows the participants’ awareness of concepts that relate to the sustainability, in terms of durability, of solar energy in the long-term, and of the issue that other energy sources, such as biomass, are indeed limited. This, independently from their age and status. Therefore, they are aware that their over consumption badly affects the local environment and people’s health. My analysis also shows the respondents’ knowledge of local climate patterns, and of how these influence the performance of solar energy systems.

Solar Mamas’ expertise in rural energy technology

Although I asked the participants about their awareness of the environmental impact of energy use, many respondents associated the concept of environment to their technology expertise in the field of rural energy. This theme emerged during the interviews and, as shown in Fig. 15, I classified as a sub theme of ‘environmental awareness’. This is a new insight in GED and women’s empowerment in development literature in the context of rural Rajasthan.

When talking to the participants, the SCEs showed great expertise, this is also

due to the specific training and tasks they perform dealing with solar cookers. [81] For instance, one commented, “I learnt how to balance the solar cooker and change its inclination according to the sun light” (Rashmi, 45, no IL). Sonali, another SCE (28, no IL), commented:

> I know that there might be some technical problems because of the solar clock that needs to be regulated when the solar cooker is transported somewhere else.

Chandni (38, no IL), added, “there should be an open space to use the cooker and there shouldn’t be plants or trees around”. Two engineers (25, DL; and 30, DL) and two teachers (50, lives on campus, and 40, ML), also indicated having acquired technical knowledge. For instance, Pooja, a SE (25, DL), for example said, “the gravity of the panels needs to be checked regularly and monitored”. She also commented, “the battery should be kept in a safe place. It should be cleaned from time to time and the panels as well”. Another engineer said, “the panels should be in the direction of the sun and the sun beams should be sharp” (Diya, 30, no IL). Roma (40, ML), a teacher, commented that, “the solar panel should be installed in a place where it can receive and absorb the sunlight from two sides”.

My analysis shows that the exposure to the solar technology training provided the participants with awareness and technical expertise on energy technology and the implication of solar energy on the environment. Perhaps, their knowledge is greater than that of their family members’ or that of members of their community. Having energy technology skills and knowledge of environmental issues adds extra value to the engineers’ competencies, since they are aware of concepts that maybe men and

[81] I discuss further the content and the implications of the solar cooker’s training on the participants in Chapter 6.

other members in their family and communities ignore. This can, therefore, have 'transformative' impacts in women's lives and positively influence their status and position within their household and community, as my analysis of the findings in the next chapter show. Providing rural women with knowledge in domains that are usually reserved for men, including rural energy technology, contributes to challenging stereotypes of gendered roles and responsibilities and the issue that the science and technology domain are reserved for men (Kooijman et al., 2018). This supports addressing social inequality in education and expertise and respond to the global call on equality in education and women's empowerment.

5.2 Significance of the solar programme for local women and their communities

In the following sections, I discuss the findings from the interviews with the SMs. I then discuss the findings from a focus group with local women who had the solar panels installed on their roofs to investigate whether and how, the solar programme contributed to women's 'effective' and 'transformative' empowerment. Fig. 16 shows the themes that I selected for the discussion. The themes tied in with my framework are: 'improved living and working conditions', 'cooking practices', 'time management', 'children's education', 'safety', 'engagement in the public sphere', 'financial benefits', and 'income generation' as a sub theme. The identification of 'multiple level of energy access' emerged as a sub theme.

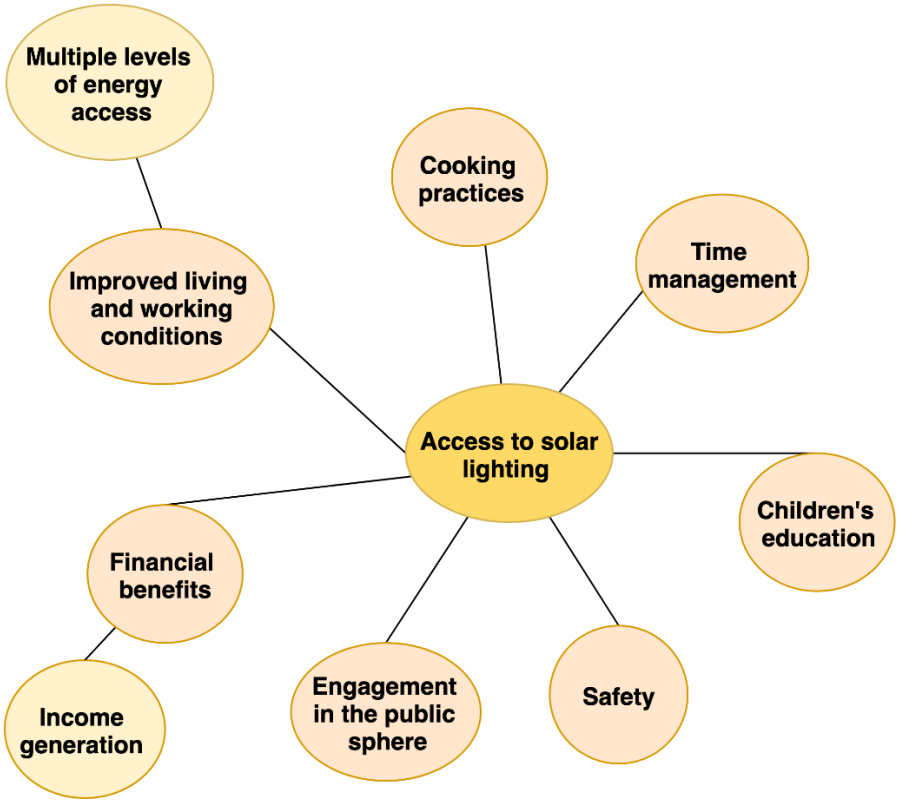

Fig. 16 Outcomes of the solar programme for local communities

5.2.1 Improved living conditions for rural women and their communities

When I asked about the availability of energy services in their area, the interviewees recognised that the scarcity of reliable energy service is detrimental to their development and that of their communities. This theme is tied in with my framework. Access to reliable energy service is globally considered as fundamental for people's wellbeing, and for their human, social and economic development (UN, 2011). Thus, understanding how and to what extent energy access can satisfy rural women's basic needs in their daily life, and how it can contribute to further development is essential. My analysis shows that accessing light can improve the living standards of local communities; therefore echoing previous studies that report similar findings (e.g. Sovacol and Drupady, 2016). As shown in Fig. 16, I classify it as a sub theme of 'access to solar lighting'. Further to this, my analysis brings new insights that highlight the importance not only of accessing energy but also of recognising multiple levels of energy access and how they affect energy users differently. This is a sub-theme that

emerged from my analysis and that I discuss in the sub-section below.

The interviewees commented that access to light through their SHSs benefits the communities in different ways. Key implied areas that they recognised are: energy provision to satisfy the communities' basic energy needs; improved cooking conditions for women; and increased children's education, as I discuss further in Chapter 6. Six women also referred to increased safety, and five to financial benefits (not having the communities to pay the electricity bills).[82] Five engineers (27,DL; 35, DL; 30, DL; 43, separated; and 50, ML), one STs (52, ML) and two SCEs, (42, lives on campus' and 38, lives on campus) explained that the lack of lighting affected them particularly in regards to their gendered responsibilities when cooking, as I further discuss in the next section. Six participants (23, DL; 55, ML; 35, DL; 30, DL; 43, separated; and no demographic info) mentioned the negative impact of relying on the sunlight on their time management. Krisha, one engineer (27, DL), for instance, commented, "before we [women] had to finish lots of task that we usually do outside before dusk, for example, fetching things and cooking since women cook outside as well". They recognised that accessing solar light is useful since it can enable them to manage their time better. The interviewees' answers suggest that with lighting they are able to clean early in the morning and cook after dark. This, notwithstanding their age and status. I found that having light at home was one of the major benefits of solar energy because this provides rural women with better quality light and enables them to see when it is dark. For example, Prestha, a NW (55, ML), commented, "solar will save women's time". This time could be spent, for instance, in educational and income generation activities to contribute to their human, social and professional development and empowerment (Clancy et al., 2002). However, as I discuss in section 5.1.3 and 5.2.2.1 there are discrepancies among the participants. These findings also show that there

[82] As I explain at page 147, each household that receives the panel pays for it. The VEEC, formed by men and women of the community, gathers the sum from each family.

are differences related to the use of and benefits deriving from access to energy between women and men, and that these are influenced by gendered roles and responsibilities within the household.

The development intervention of the Barefoot College took into consideration the whole household needs when supplying solar light to the communities. The SEs provide households with a solar panel and two light bulbs; one is installed inside in the communal room where the family gathers and where everyone in the household can benefit from it. Usually, this is also where women cook and children read, and where perhaps women can carry on other activities to increase the family's livelihoods, such as tailoring, stitching, and so on. The other light bulb is installed outside for safety issue and to look after the animals. These findings seem to contrast with previous studies on similar interventions. For instance, Cecelski (2000b) discusses a project in Ghana in which, while women preferred the light bulbs to be installed in the kitchen and close to their bathroom for safety reasons, men chose the front of the house where they could host friends. Winther et al. (2018) discusses a study in Kenya where the men of the house decided the room/s in which to install lightbulbs. My findings also stress the issue that perhaps, development interventions on energy, in order to be successful in addressing inequalities within the household, should adopt an approach that reflects multiple needs. While accessing light is already a step towards communities' development, the provision of gender-aware energy services can further improve the living and working conditions of men and women therefore contributing to an egalitarian distribution of resources (Clancy et al., 2004; Prebble and Rojas, 2017).

The interviewees also considered that the lack of energy services affects the whole community. An engineer, for example, explained: "[p]eople from my village are really poor, so it's difficult for them to *work it out* on a daily basis since there is no light all around. It's not easy when you do not have access to light; the day-to-day routine

is hindered" (Madhu, no info, widow, DL).[83] Several of the interviewees referred to the detrimental living and working environments in which the rural poor practice their daily routines without access to energy. A ST commented, "there are no shops around; it's a totally remote village so I have problems in accessing basic items" (Shikha, 27, lives on campus). It is the case that the rurality of the location and the lack of electricity constrain business opportunities and further development of these communities.

Multiple levels of energy access

Other considerations arise from my analysis of the findings in regards to the provision of electricity through small-scale solar PV systems. This theme emerged during the interviews. On the one hand, three interviewees recognised the prospect, through energy service, to increase their means. A new trainee also referred to her community when she said:

> I'm happy that I will be able to install the lights and also for people's livelihoods, since once my village will have light, they will be able to do much more (Aditi).

On the other hand, two SEs commented that through the implementation of the solar programme of the BC it is only possible to get light. This is a new insight that emerged during the interviews. Prisha (35, DL) commented:

> [s]olar energy can be used only for light. It can only be used for four-five hours a day. At home, we [her household] have access to two light bulbs of 40 Watt each.

[83] With 'work it out' the interviewee meant 'to find solutions' to satisfy their needs given the lack of energy services.

Similarly, Saumya (52, ML) said, “[t]he capacity of the panels is only for light bulbs; it should be stronger in order to use also fans and coolers”. Diya (30, DL), also commented, “[p]eople from the villages want electricity”. Five engineers (20-40, DL; 52, ML; 30, DL; 43, separated; and 30, DL) said that nearby villages finally have light and they could charge their mobile phones and batteries. In the same vein, Krisha (27, DL), said, “villages nearby want to have the solar panels as well“. There is evidence of off-grid communities’ willingness and need to access electricity for different uses. Working at a grassroots level, the engineers best understand their community’s struggles and can identify solutions.

My analysis shows that access to modern energy services can support the achievement of women and rural communities’ material needs enabling them to improve their daily practices, and their productive needs by, for instance, broadening their income generation opportunities. These findings echo those of Clancy et al. about the “need to move beyond the light bulb and promote more productive uses of electricity” (2004:16). Having women as engineers that provide households with light bulbs and a solar panel is a step towards communities’ recognition of women as agents of change, and it is, as well, a step out of darkness. This can have positive impacts in remote areas both for women, in terms of their empowerment as change agents, and in terms of being able to see. However, my analysis also suggests that there are different levels of energy access and that these affect energy users in different ways. The interviewees recognised that for further wellbeing and development of communities, they should be able to also use electric appliances (such as fans and fridges), which could enable them to start small business. These are new insights that show women’s awareness of different scenarios to that of poverty and marginalisation of rural communities. Therefore, access to solar PV Home Systems can respond to some of the energy needs of rural communities. Development interventions need to be

bridged with the availability and reliability of energy service for the wellbeing of local communities (e.g. fridges for better food conservation/nutrition) and for productive uses to promote greater development in rural areas. My analysis shows that access to lighting enabled women's 'effective' empowerment in terms of being able to better perform their tasks than before, but it did not imply 'transforming' social relations and roles within their household.

5.2.1.1 Lighting and cooking concerns for local communities

Access to lighting, and how this influences cooking practices are themes embedded in my framework. In this section, I discuss the findings from a focus group with local women. When I asked the participants in the focus group about the availability of energy service in their area, they commented that the connection to the grid is available in the main roads not so close to where the community is based and it serves only a few wealthier families. Without the solar panels installed by the College, this community was relying on kerosene lamps.[84] The participants said that this is expensive and that they use it during the monsoon season when the solar panels do not operate properly. Thus, the solar programme provided a better solution in terms of lighting, as the participants claimed. They added that although a bit expensive, having to pay for the panels with instalments over a period of three years, they felt it has been a good investment since the quality of the light is good, and the panels have been working since 2007. [85] As I discuss in section 5.2.2, rural communities often encounter

[84] Four to five participants talked the most, and a contrasting opinion did not appear. I observed during the group discussion that their mood was high although living in extreme poverty, because the interviewees were often laughing. The group also appeared very cohesive.

[85]As I explain in Chapter 4, section 4.2.2.2, one of the challenges of the focus group discussion was the difficulty I encountered in following the conversation among the participants; this happened, perhaps, since the interviewees often talked altogether and the translation was not simultaneous. Sometimes, it was not possible to know if there were contrasting opinions or particular insights. A participant, Myra, was especially active in the conversation and it appeared that the others chose her as a representative of the community; they wanted her to go to Tilonia and train as a Solar Mama as I explain later.

financial constraints on the adoption of RET solutions.

I then asked the respondents about the kinds of energy sources available in their area. The interviewees commented that they use biomass for cooking. This is collected in the nearby woods; however, since the government forbids this, households collect it in bulk. In terms of decision making on resources, from my observation during a visit to this community, it was evident that the local women do not have a choice on an alternative, cleaner option than firewood, since this is the only source available to them. When talking with the participants, they said that they face many issues due to the lack of energy service and they spend most of their time at home in the dark. The light bulbs provided by the Solar Mamas ease women's duties since they can see better to cook, to do the house chores, and to wash their clothes at night. The participants commented that overall their time management has improved and that they feel safer being able to see whether animals or insects attack at night. However, as I further discuss in sections 5.2.2.1 and 5.2.3, there is no indication of women's engagement in educational or income generation activities during their free time. They also noted that their health conditions and vision have improved since they rarely use kerosene lamps and candles. Therefore, although affecting people and the local resources, overall, the environmental and health impact of the fumes is reduced when using solar energy. As Cecelski (2004) and Dutta (2019) suggest, solar PV systems offer a clean and efficient solution to the lack of electricity in rural areas, and see women as beneficiaries because they ease women's work within their household. Additionally, my findings resonate with Clancy et al. (2012), when they assert that electricity can be used strategically to improve women's safety. My analysis suggests, as previously discussed, that providing women with light is a first step to satisfy some energy needs; however, it is difficult to gauge which energy needs should be met, in a poor household, in order to transform women's lives. While there is indication of women's 'effective' empowerment, the lack of alternative, affordable, and clean energy

choice (e.g. affordable solar cookers), the lack of resources for and of participation in decision making on the purchase of electric appliances inhibit their 'transformative' agency.

5.2.2 Local women's engagement in the public arena

Access to energy is claimed to be strategic to facilitating women's participation in the public sphere because it contributes to their safety and mobility (Clancy et al., 2012). This theme is tied in with my framework. However, my findings seem to contrast these studies in relations to the respondents' participation in the public sphere because, although accessing solar light, the interviewees continued to be unable to engage in the public arena due to patriarchal, mobility, and political constraints that marginalise them.

Living in poor conditions in a rural settlement, the women engaged in the focus group commented about feeling powerless in terms of addressing energy poverty issues their area. The participants claimed that there was an unfair political system and that they mistrust the local politicians who only visited them during the elections. They said that when a representative of the community attended *Panchayti* meetings, politicians made false promises. One of them said:

> it is impossible for us to do anything since we don't have the financial means. The politicians are not interested in us since we are not a powerful community (Leisha).

These comments echo Fernandes' (2004) argument about the middle class and the state 'forgetting' poor social groups and excluding them from participating in political

spaces, enhancing inequalities.[86] It seems that the government is unable to support the development of these communities, and therefore, the intervention of the NGO has been pivotal to address partially issues related to the lack of energy in rural areas. Given that this is a small community, women regularly meet informally and attend some groups; in terms of their empowerment, they commented that accessing light and the intervention of the College are starting steps for their development. On this point, only one of the interviewees commented, “my boy wakes up early in the morning to read before going to work”, therefore making the most of the light from the bulb to read (Myra). It seems that lighting can have a transformative influence on the sons and daughters (therefore, an intergenerational impact on the second generation) of those families who access it. This aspect of energy access reflects the issues of the temporality of change and that, perhaps, current generations need extra elements in place in order to generate transformation, as I discuss later. Two key questions arise from these insights: how transformative is access to solar light for rural women in terms of challenging their roles and responsibilities? How transformative is it in engaging women in activities that could change their position and condition with their communities? I address these key questions because they are related to my theoretical framing I set out in earlier chapters, and because the answers to these questions are explicitly linked to my research objectives.

None of the women engages in reading or any other educational activity. This might be due to women’s resistance to change, or because the rural women who participated in the focus group are illiterate or semi-literate. Thus, there is evidence also of a lack of better institutional support; for example, a literacy programme by the government or other agencies. Rewald (2017), for instance, claims that there are no explicit links in the literature on women, energy and development between

[86] Fernandes states: “[t]he politics of forgetting […] refers to a political-discursive process in which specific marginalised social groups are rendered invisible within the dominant national political culture” (2004:2416).

electrification and improved literacy (e.g. time spent reading). My analysis suggests that energy access contributes to women's 'transformative' empowerment if supported by other factors including education, participation in the public sphere and in decision making.

One of the participants, Myra, expressed her willingness to become a SE; she was the chosen one among the other women. However, she said, "I need to ask my son for permission, and the College is far away; I wouldn't know how to get there". These comments suggest that patriarchal and mobility issues constrain these women and exclude them from the participation in educational programmes and in the public sphere. Although there is a rural workshop based in their community where members of a partner organisation of the Barefoot College can fix the panels if anything happens, the women recognised that having one of them trained as a SE, would make a difference in their community. This would not only guarantee an income, but also raise the profile of their community and its status. One of the participants said, " […] so we would all be proud; otherwise, there is nobody aware" (Shruti). Having a local woman working in a non-customary role in energy could raise women's voices and improve their position and condition in their community. The role of the NGO has been critical in providing light to this remote community that has been excluded from the government grid expansion, by improving women's 'effective' empowerment. However, there is no indication of 'transformative' empowerment in terms of their increased mobility and participation in the public sphere.

5.2.3 Financial benefits for the Solar Mamas and their communities

In this section, I discuss the findings related to whether access to solar energy benefits the participants' strategic energy needs, including their financial needs, in consideration of the cost of fuel in rural Rajasthani areas. GED literature recognises affordability of reliable and clean energy systems as a key theme because this is

essential for social justice (Bhattacharyya, 2006; Pachauri, 2011; Clancy et al., 2012). Further to this, my analysis highlights specific benefits of accessing solar energy in particular; among these, the interviewees mentioned the financial sustainability in terms of the long-term durability of their investment.

Among participants' answers, three STs (30, no IL; 35, DL; 50, ML) out of 24 (STs, SEs and NTs) commented that the investment cost of the SHSs could be a deterrent for the adoption of solar energy for rural communities. Shwati, a ST (35, DL), for example, said:

> the investment cost is too high for poor people and they cannot afford it. Therefore, they rely on electricity when available. Rich people can afford to invest in solar so they are eager to get it.

Seven of the respondents (three STs, 30, no IL; 30, lives on campus; 50, lives on campus; three SEs, 52, no IL; 25, DL; 40, DL; and one NW, 37 no IL), identified opportunities for cost saving. For instance, Saumya, a SE (52, ML), said, "I don't spend money on oil", another engineer made the same comment. Two SEs (25, DL and 40, DL) said that they would not have to pay the bills; similarly, Binita, a ST (50, lives on campus), commented, "solar [energy] is cheaper", than other energy sources. A ST said:

> solar energy is more comfortable than electricity because with electricity you have to pay the bills. You only pay once for the panel, and plus it's better since there are no fumes (Nidhi, 30, lives on campus).

Another also commented, "[w]ith solar energy you only need to invest once, then the energy is always there" (Divya, 30, no IL). Also Shahana, a teacher (50, ML), said,

“solar is good because you can use it everywhere and for everything” highlighting the versatility of the solar lanterns. Similarly, another teacher (30, no IL) emphasised that children attending the night schools also use the solar lamps that they made at the College.

Eight of the 32 women interviewed spend between a third and a fourth of their household income between electricity and fuelwood; seven spend less than a fourth of their salary on fuelwood or electricity, three spend half and one spends more than half. Eighteen of them fetch fuelwood on their farms or in nearby areas. Two interviewees commented that although they can access gas, they prefer to use firewood since it is cheaper. Shahana (50, ML), commented, “[g]as is easy to access but it's expensive. Firewood needs to be collected from the jungle but it's not costly”. Similarly, an engineer stated,

> [a]lthough we [her family] can access gas, it is more expensive, so we use fuelwood. It is difficult to access and I have to walk for 20 minutes to get it” (Megnaa, 38, no IL).

These findings highlight that there is clearly an issue of cost, and hence affordability, of cleaner fuels that is dictated by the energy market. As Laxmi et al. point out, “[i]f households can afford to purchase fuel-wood, they will be better off purchasing commercial fuels, which are cleaner and more efficient” (2003:54). On this note, Pachauri (2011) emphasises that modern energy access should not consider the single dimension of the physical supply, but also the availability and reliability aspects in order to ensure equality. My analysis shows how access to solar PV home systems, through the SMs’ programme, contributed to satisfy the participants and their household’s strategic needs and interests. My analysis suggests that there is indication of women’s awareness of the specific benefits of solar energy, such as financial

sustainability in the long-term, and of their strategic thinking about the future demand of energy by their communities. The engagement in the training and in the College life contributed to their awareness and critical thinking.

5.2.3.1 Income generation opportunities for local women

GED scholars claim that access to energy can facilitate women's economic empowerment through activities such as handicrafts, tailoring, stitching, and embroidery to contribute to the household budget. I discuss this theme because my findings seem to contrast previous studies, for instance those of Clancy (2003); Dutta (2003); Oparaocha and Dutta (2011). In my study, due to the lack of crafting skills or other resources, the participants in the focus group are not engaged in such activities. When talking with the interviewees, none of them is engaged in revenue activity. They also mentioned that they do not have specific skills or resources to start the kinds of activities mentioned above. From my observations, perhaps this could be because of the remoteness and the marginalisation of these communities from participating in education or other skills transfer initiatives, and due to mobility constraints, as discussed in the previous section. In addition, I also observed that the lack of a market also impinges on their ability to generate revenue. It is also questionable whether the kinds of activities as those mentioned above (e.g. stitching, embroidery, etc.) challenge prescribed gender roles and responsibilities, since they are considered women's work.

Three women mentioned that the government employed them to work in the salt lake area during the summer; therefore, they can contribute to the household budget. By accessing light, the interviewees commented that they enjoy longer days, because they are able to have up to four hours more with light available. One woman who works in the field with her family said. "I can do the house chores before and work longer in the field" (Latika). My analysis shows that there is indication that energy can improve women's welfare and their efficiency (because they are able to perform better their

practices and routines within the household), thus contributing to satisfying their practical needs. However, it is questionable the extent to which access to energy per se can be 'transformational' in terms of challenging their position and condition in society. There is also the risk of energy enabling the instrumentalisation of women's contribution by allowing extra working hours. As Clancy et al. point out, "[t]here are mixed findings [on] what use is actually made of the lighting and electricity", although there is a tendency of energy access often adding on extra burden on women's already taxed workload (Clancy et al., 2004; Batliwala, 2010). Nevertheless, the interviewees commented that working longer hours did not represent a burden for them. Five participants said that they needed to do the house chores anyway; without light, they would have to do them in the dark, which would be worse. Thus, access to energy supports their 'effective' empowerment. However, since the participants are constrained within their customary roles and responsibilities, they do not have the means to generate change, and, perhaps, they are not aware of different scenarios.

5.3 Implications of solar cookers for the participants and local communities

In this section, I comment on the significance of the solar cookers' programme for local communities. Access to clean energy solutions for cooking is a critical theme in GED literature because it can positively affect women's health, the household nutritional standards, and ensure a fair distribution of resources, as previously discussed (e.g. Clancy et al., 2012). Fig. 17 shows the themes that I discuss and their sub themes. Themes tied in with my framework are: 'time management, and 'health and wellbeing; themes that emerged during the analysis are: 'cooking practices', 'financial and design constraints', and 'nutritional benefits'.

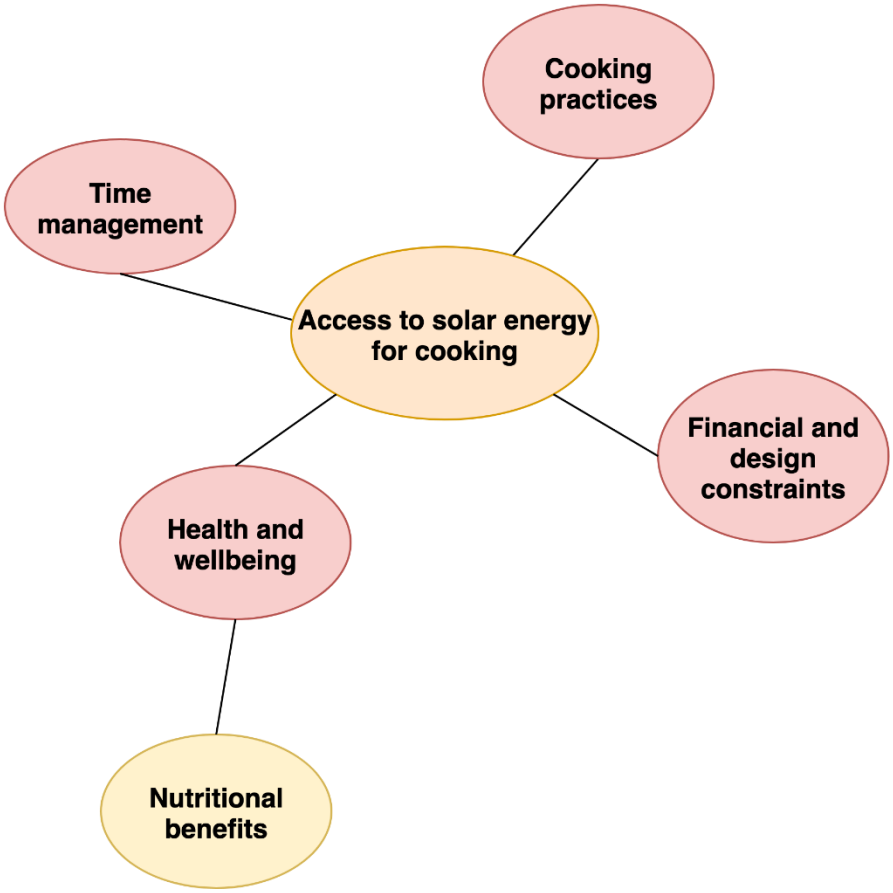

Fig. 17 Implications of solar cooking solutions

I found that the interviewees (STs and SCEs) encountered specific constraints that impinge on the use and the adoption of solar cookers; these include the time of day in which they cook, the kind of food that can be cooked, the cost and the design of the solar cooker. My analysis brings new insights by highlighting that these kinds of clean cooking solutions can contribute to greater global goals such as improved nutrition when adopted at larger scale than at household level. In this regard, the BC adopted a new marketing strategy to distribute the parabolic cookers and feed a large number of people. Therefore, the College is contributing to address broader nutritional needs, as I discuss in the sub theme section. However, the cost and design of the parabolic cooker remain as critical constrains on their adoption.

In this section, I examine the interviewees' views of how solar cookers affect

their local communities. I also discuss the findings from the focus group with local women who have been using solar cookers. The respondents' accounts indicate that eigth use gas, and 16 use firewood for cooking, while five of them said use both alternately. Although exposed to the solar cookers, since they are available in both the old and the new campus of the College, the STs and the SCEs have not changed their cooking habits. The SCEs seldom use them to make *chai* when working, while the SC workers use them regularly to heat up drinks and cook meals in their field centres, as I discuss in the sub section below.[87] In conversation with the interviewees, another constraint on the adoption of the cookers that the participants pointed out was the weather conditions in the winter, or in the monsoon season, which can hinder the cookers efficiency. When talking to SCW they added other perspectives to those discussed by the SMs' because the SCW use the cookers on a daily basis at work. They said that using the solar cookers helps saving money that would be spent on wood or other fuels, and that they can perform other tasks while the food is cooking, therefore saving time.

5.3.1 Time management

'Time management' is a theme embedded in my framework. Among the constraints on the use of the cookers the interviewees mentioned the time of day; to be able to use them at their maximal potential, they would have to cook at lunchtime. This is when most of the women work, and it is also the hottest time of the day. In rural areas women usually cook in the morning before they or members of their family go to work, and in the evening when they get back. In rural Rajasthan, temperatures can reach 45 Celsius in the summer if not more; therefore, it is impractical to be outside

[87] *Chai* is a typical Indian drink made with tealeaves, milk and spices.

and stir the food. For instance, Gangi, a SCE (35, DL), commented, “[u]sually when they [women] have to leave to go to the field they use gas”. Similarly, a teacher said:

> the solar cookers can be used at lunchtime only; this is when I am working on campus and I eat at the canteen. I would not be able to use it in the evening when I am back home since there would not be enough light (Binita, 50, lives on campus).

Perhaps for similar reasons, I observed that, although solar cookers were available on the rooftop of the main canteen on campus, the cooks of the canteen preferred to use gas since they had to cook for breakfast, at lunchtime and for dinner. Somehow, none of these timeframes is suitable for using the cookers since in the early morning and in the late afternoon the sun is not that strong, while at lunchtime it would be too strong. Pohekar and Ramachandran (2005 cited in, Cuce and Cuce, 2013), in a study on improved cooking solutions in rural areas of India, report that LPG stoves are preferred to others; they suggest that, in order to promote the use of parabolic solar stoves, their behavioural, technical and commercial benefits should be enhanced. Studies, including those by Laxmi, (2003), Cecelski, (2006) and O’Shaughnessy et al., (2013) argue that improved cooking stoves, such as solar cookers, save women’s time when cooking, and because they do not need to fetch firewood. My analysis shows that to cook at its best the time span for the cooker is two to three hours. While it is true that the participants who use the improved cooker do not fetch fuelwood, it is not clear whether it is quicker to cook with these. Women involved in the focus group said that, on average, it takes around ten minutes for the water to boil, an hour to cook vegetables and pulses, and half an hour to cook rice on a good day. Sometimes, this is quicker than cooking with gas; however, Eeshani said, “I have gas at home, so prefer to use this since I can regulate the flame with the valve”.

5.3.2 Impact of solar cookers on cooking practices

It is interesting to point out that certain food, such as *chapati*, cannot be prepared on the cooker since it is not possible to regulate the temperature. These insights emerged during the interviews. On this issue, Gangi (35, DL), commented, “to make *chapati* it is difficult because it is needed to stay in the sun and it's hot. The other food can be left unattended”. Similarly, Eeshani (no demographic info), from the focus group said:

> [w]e [she and the other participants] tried to make chapati but it didn't cook well because the temperature needs to be changed at times, so it was sticky and uncooked inside.

These findings echo Cuce and Cuce when they assert that:

> [s]olar parabolic cookers can reach extremely high temperatures in a very short time […]. However, a parabolic cooker includes risk of burning the food if left unattended for any length of time because of the concentrated power (2013:1405).

The interviewees also mentioned that they use the cookers mainly in the winter to warm up water for their daily needs and to warm up food at lunchtime. None of the interviewees mentioned any problems in regards to the cultural suitability of the clean cookers. Although they are not used for domestic purposes (in terms of household use), they are used in crèches, field centres and other institutions, as I discuss later in this section. These considerations seem to contrast with studies in other socio-cultural settings, such as in Mexico and Afghanistan, in which the cooking fire is seen as a

place for women to socialise with other family members, as reported by Clancy et al. (2012). Installing improved stoves inside or outside (as in the case of the parabolic cookers) might weaken women's network and further marginalise them if local customs are not taken in to account (Green, 2001; Masera et al., 2005; Standal, 2008 cited in Clancy et al., 2012). Perhaps, in the rural Rajasthani context, cooking and the time spent to cook are not for socialising, but rather one of the chores reserved for women. Uneven power relations within the household might also determine whether clean stoves are adopted and, if so, where they are located (Khandelwal et al., 2017). Although due to gendered roles and responsibilities the kitchen is considered a domain of women, technology is traditionally seen as a male sphere, therefore, decision making on the purchase of energy appliances is reserved to men (Masud et al., 2007). Therefore, understanding the social, cultural, and political context in which development interventions operate is key to identifying challenges to social equality and for the empowerment of girls and women. This understanding can facilitate transformation if accompanied by tailored approaches to accommodate local women's needs and interests. In these kinds of scenarios interventions by NGOs, such as the Solar Mamas' programme, support rural women to challenge these preconceptions, and influence a transition towards energy technology implementation and culture driven by women.

5.3.3 Financial and design constraints

'Financial constraints' and 'design constraints' are insights that emerged during my interviews. The intervention of the BC challenges top-down approaches to the adoption of these kinds of innovations. For instance, development programmes often provide free stoves to families (Barnes et al., 1994; Bhogle, 2003; Khandelwal et al., 2017). The College sells the stoves to communities, therefore encouraging a feeling of ownership by the communities. However, one solar cooker is around 15000 INR; thus,

it is unaffordable for the rural poor.[88] It is also often be the case that the models are not always tailored to the family and socio-cultural needs (ibid.). At the College, the SCEs participated in the design of the stoves and modified them to their needs, therefore taking into consideration women's ideas and knowledge. A SCE said that in order to improve the solar programme:

> I would like to modify the measure of the solar panels and change the structure of the cooker using a more advanced methodology like the cookers I saw with other engineers on a trip to Mont Abu (Gangi, 35, DL).

However, as showed in Fig. 12 the parabolic cookers are quite cumbersome; they require a certain amount of free space around them to be able to turn around according to the sunlight and be used at their maximal potential. Therefore, they are not suitable for balconies in apartments in urban areas. For instance, Jinal (no demographic info), a local woman from the focus group, commented:

> [d]ue to the design of the cooker, only one pan at the time can be placed on the stove; therefore, only one family at the time is able to use it.

It is the case then that families can cook only one meal at the time. This constrains their time management and their cooking practices.

5.3.4 Health benefits for the participants and local communities

'Health and wellbeing' is a theme tied in with my framework. In conversation with the interviewees, they commented that, since they use either gas or firewood, their

[88] Average exchange rate of 15000 INR in 2015 is €205.47 and £153.

health condition has not changed that much. On the contrary, the SC workers commented that using the solar cookers prevents being burned while cooking (as might happen when using firewood), and there is no smoke; therefore thus positively affects their health.

Increased nutritional benefits for local communities

In order to address the issues of cost and design of the solar cooker, the NGO adopted an innovative marketing strategy by selling the cookers to crèches, schools, government offices, hospitals, field centres, nurseries, and so on. This new application is suitable for the cookers since it is possible to cook a large quantity of food, and, therefore to feed more people. This supports rural communities' nutritional needs and promotes the adoption of clean energy cooking solutions. The findings add specific insights to literature on energy and women's empowerment in development; in particular, they highlight that by using the parabolic cookers it is possible to cook for a large number of people, and that the food cooked with the solar cookers is healthier compared to that cooked with charcoal.

According to the comments of two of the interviewees, food cooked with the cookers is healthier than cooked on fire because the temperature is more even, therefore retaining the nutrients; this, for instance, has positive impacts on the health of children. Sonia, a SCW (no age info, no IL) said that with solar cookers, "[t]he food is cooked better"; similarly, a SCE commented:

> [s]ince the stoves are used in nurseries and crèches, many infants from 6 months to 7 years old are fed through them. The quality of the cooking is better and children are healthier (Rashmi, 45, lives on campus).

My analysis suggests that parabolic cookers are more suitable to feed large groups of

people than to feed a family unit. In particular, the analysis of the social aspect of the cookers highlights how solar energy, which is a natural, unlimited and free resource, can be applied to address social issues and inequalities (including, in this case, those related to health and nutrition) without preconceptions (including gender bias) on beneficiaries of the intervention. For instance, the clean cookers are used to feed everyone (boys and girls, men and women) within field centres. Moreover, the adoption of these kinds of appliances sees women working in the energy technology sector as the leaders of social change that affects the broader community. This shows a shift of women's roles within their communities: from being passive beneficiaries of development interventions, they can become empowered to generate change with the appropriate support and training. Additionally, this shift in the use of the cookers for the broader community nutritional needs highlights how solar cookers can respond to wider human nutritional needs than to women's cooking needs, as also suggested by Baruah (2015). However, the inclusion of affordable options for local communities could improve of the solar cooker's programme.

5.4 Women's collective agency to address cooking needs

The engagement with the NGO has prompted some women's collective action to build mud *chullah* stoves in order to address their cooking needs, therefore promoting their 'transformative' empowerment. This new finding emerged as part of my fieldwork observations. Given the limitations in the use of the ovens discussed above, women at the college started building their own *chullah* of mud with a pipe for the fumes. They placed them in the patio of their household with the pipe facing the yard so that the smoke would not enter in the house. The adoption of *chullah* stoves is the outcome of local women's collective action to respond to their cooking needs. This shows how the engagement with the College facilitated their collective 'transformative' empowerment. This kind of improved stove is perhaps best suitable to women living

on campus and in the nearby area since it is cheap to build (women build the pipes with recycled material and they use local mud), it is tailored to their needs (since they modified its design accordingly), and they use local firewood, which is mostly free. Moreover, in terms of the environmental impact, it can be said that although CO_2 emissions will still be produced by the combustion of firewood, at the College women use biomass that is sustainably and locally produced, therefore, lessening its impact.

My analysis shows women's 'transformative' and collective agency since they questioned and challenged the customs and identified solutions to accommodate their practical needs and priorities. This outcome of women's involvement with the organisation also shows how the College has been flexible in adapting to community needs, has facilitated local women's empowerment in taking their own initiatives, and has supported them in their activity by providing a 'space for manoeuvre'. The locality, as a safe and egalitarian environment, and the temporality, as having time to generate change, have played a key role in this process. I suggest that this 'space' is not only intended in its temporal (time to question inequalities) and cognitive (individual reflection, consciousness-raising) dimensions, but also as a physical place, the campus, where women can experiment and challenge socio-cultural constraints and initiate individual and/or collective actions for their 'transformative' empowerment. My findings also resonate with what Clancy et al. (2004) claim in regards to the need for NGOs and other development institutions to adopt a bottom up and open approach to enable women to initiate their own change. It also echoes principles of popular education by which, life experience is equally important to the knowledge attained through formal education, and with the philosophy of the Barefoot College that emphasises the importance of recognising the value of local knowledge and skills (Wiggins, 2011b; Barefoot College, 2015e).[89]

[89] See the discussion in Chapter 3.

5.5 The Barefoot College approach in promoting empowerment

In this section, I discuss the NGOs professionals' view of how the programme facilitates participants' empowerment in order to understand their approach and the ethics underpinning their work. This and the following sections bring specific insights on the role of the training and of NGOs in promoting rural women's empowerment in the Rajasthani context. Fig. 18, shows the themes tied in with my framework: 'gender equality in participation', 'participation in decision making', 'self-confidence and esteem', 'employment', 'improved quality of life, 'safety' and 'challenging gender roles and responsibilities'. 'Exposure and exchange' emerged during my interviews.

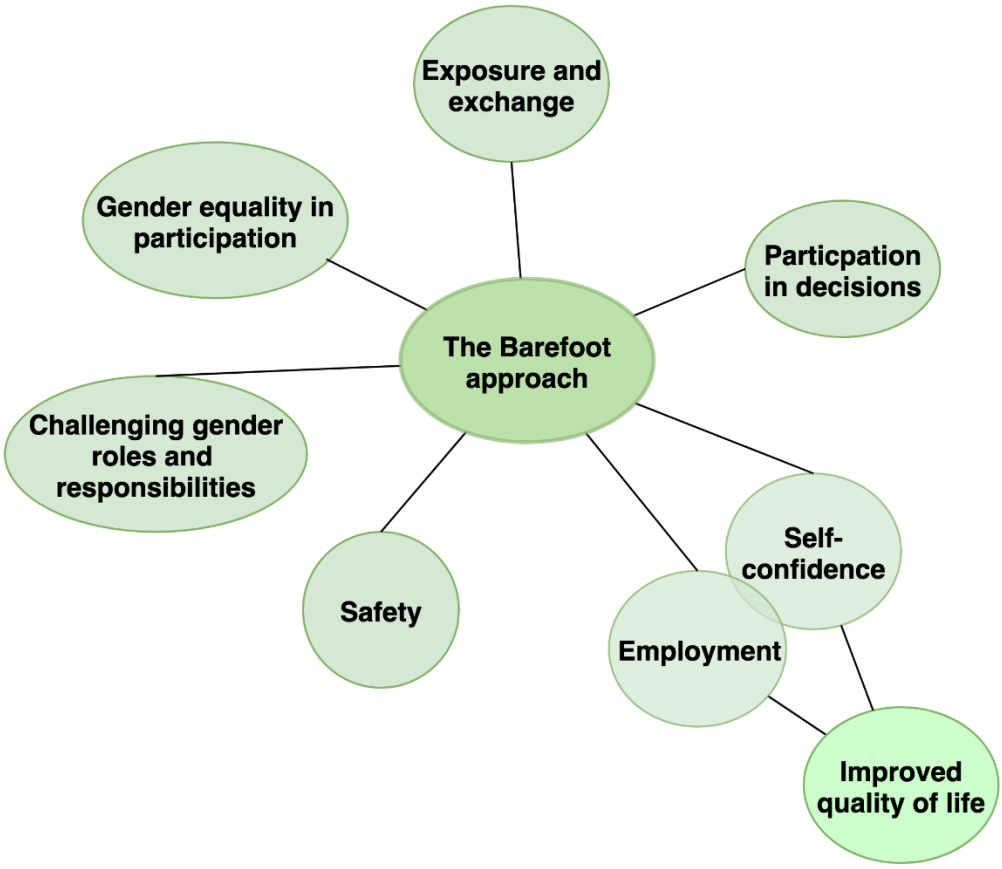

Fig. 18 The Barefoot College approach in facilitating empowerment

5.5.1 Gender equality in participation in rural energy programmes

The College claims that women's engagement in the energy programme facilitates their empowerment and transformation in women's lives. I evaluate their claim based on women's empowerment and GED research. The views expressed by the NGOs professionals resonate with the UNDP (2004) argument that, although women spend more time in the household than men, they are often discounted from participating in training on the maintenance of SHSs. In addition, "there can be no logical reason why women, with some appropriate training, cannot fill the role of energy entrepreneur just as adequately as men" (Clancy et al., 2004:19).[90] As discussed in Chapter 3, there is evidence of projects in India where women have performed even more successfully than men (Batliwala and Reddy, 2003). This theme is tied in with my framework.

According to the Barefoot College Annual Report:

> women have always been considered the central pillar of many of the programs designed at the [organisation]… [r]ecognizing the fundamental role of women as educators, caring members of the communities, and repositories of traditional and environmental knowledge (2015a).

In conversation with the solar programme coordinator, Bhagwat Nandan, he said that "[i]n India there is still lots of work to do in terms of gender equality" and that:

> [w]omen engaged in the programme are used to live in a partriachal society were men dominate. Going to the College for them is illuminating since they can see how women teach, get involved in different projects, there are

[90] UCT et al., (2019), discuss the case of women energy entrepreneurs in rural Rwanda. The findings show that there are no significant outcomes differences among female, mixed and male village entrepreneur groups.

awareness raising programmes and women's rights programmes.

There is indication that the College is providing an opportunity and a space for marginalised women to challenge their position and condition in their household and community.

5.5.2 Exposure, exchange, and participation in decisions

Another aspect of the NGO strategy to facilitate rural women's empowerment is that of engaging rural women beyond the energy training (e.g. by engaging some women in the NGO life), in order to ensure best their participation and empowerment at different levels. As explored in Chapter 2, and as I further discuss in Chapter 6, 'participation in decision making' is embedded in my framework of analysis and is considered as critical to achieve greater empowerment (Kabeer, 2017). My findings bring new perspectives to previous studies when they argue that:

> [e]nergy organisations both in the public and private sector, as well as civil society (such as NGOs dealing with energy) tend to be male-dominated, particularly in the professional posts. This male-dominated structure results in men talking to men about energy issues. As a consequence, the fora where the issues are identified, and any potential solutions proposed, tend to have an inadvertent male bias (Clancy at al. 2012:32).

The Solar Programme Coordinator stated:

> [t][he exposure and exchange brings lots of awareness and empowerment. All the solar teachers (men and women) have trained as solar engineers. They all participate in the decision making, run the teaching batches and do

all the work themselves (Bhagwat Nandan).

As I also discuss in the next section and in Chapter 6, it appears that the engagement with other women in similar positions and conditions contributes specific insights. This theme emerged during my interviews. Therefore, the College is not only providing material gains, such as by ensuring an income to rural women, but also contributing to the satisfaction of their strategic needs and interests, including actively participating in decisions and acquiring more control over their lives.

During my fieldwork I had the opportunity to meet some women engineers that then got involved in working in the organisation as employees in the solar programme team; therefore participating in board meetings. This resonates with Wiggins' (2001a) statement about the importance for organisers to share local community's experiences and struggle in order to best support their transformation. While talking to the solar programme coordinator, he said:

> [w]omen's empowerment is necessary since the woman is the one who is most under pressure in the family. Women look after the children, the kitchen, agriculture, animals, everything. So, the College thought that through this programme, by accessing new technology, women could become empowered. Small changes happen immediately but then in the long-term, after 5-10 years, bigger things changed in women's lives, for example, in family planning (Bhagwat Nandan).

This quote highlights the temporal aspect of empowerment as an ongoing process, and the issue that this can have both intragenerational (within a generation, affecting women directly) and intergenerational impacts on women and girls' lives.

5.5.3 Self-confidence, employment, improved quality of life, and safety

As the interviewees' accounts show, the improvement of the participants' quality of life is an outcome of their increased self-confidence and of their employment; therefore I classify it as a sub theme. The coordinator of the solar programme also spoke of increased safety as an element that contributes to the empowerment of the participants. These findings echo other studies that refer to these elements as essentials to facilitate transformation in their life (e.g. Dutta, 2019; University of Oslo, 2019). Teja Ram, the director of Manthan, and Don Ras, the coordinator of Prayatna Sansthan, two partner organisations, said that the Solar Mamas' programme improved women's quality of life by increasing their confidence and providing them with employment. For instance, Don Ras commented that participating in the programme:

> [the training] improves their [participants'] confidence. Women are exemplar to other women and motivate them. It works as a very good example and it's quite beneficial.

In particular, Teja Ram highlighted that typical income generation activities in rural areas are farming or animal husbandry; thus, being engaged in rural energy technology increases the participants' self-esteem. Similarly, Bhagwat Nandan commented that:

> [t]hey [the participants] are exposed to see what women can do so their self-confidence increases. They feel safe and secure and be able to do. (…) Women from the international community also never left their villages. They come over here and they feel safe. Safety is an important goal reached by the NGO as well.

These quotes highlight how meeting other women and the exchange among them creates new awareness and increases their confidence as mentioned as a main insights in the Introduction. Bhagwat Nandan also added:

> […]: women in general have to be indoors and their family don't allow them to go out. In order to join the programme women have to get out of their houses. Women became more confident then, learn to do more things and are more empowered.

He also added that the participants, “once they realise that they have a regular salary, they also realise that they should get a bank account and manage it”. This finding shows that participating in the training programme facilitates rural women’s empowerment by enabling them to open a bank account. Usually rural women do not have access to resources such as credit (Agarwal, 2018a; 2018b).

The greater self-confidence and esteem allowed the participants to make energy technology choices also, therefore transforming their way of thinking and behaving in the public arena. Bhagwat Nandan commented how, after the training, the engineers were more aware of technology. He reported the example of a group of engineers who went to the market to buy Compact Fluorescent Lights (CFLs) however, they found out about Light-Emitting Diode (LED), which are more energy-efficient; they bought and fixed the panels with them.

5.5.4 Facilitating challenging gendered roles and responsibilities

According to the accounts of NGOs professionals, the solar programme contributes to the empowerment of the women engaged in it by promoting a cultural shift that challenges prescribed gendered roles. This theme is embedded in my conceptual framework and highlights the critical role of NGOs in promoting

‘transformative’ empowerment as discussed in Chapter 3. The Barefoot College has been engaging men and women from the rural communities in training and projects to encourage and facilitate their human, economic and social development for over 40 years. At the beginning of the solar programme they used to train men; however, there has been a change in engaging women only in the solar programme. The solar programme coordinator said:

> [t]he focus on women happened naturally. Men have more expectations and are easily annoyed when things don’t go the way they thought they should. While training, women showed greater patience, and the ability to handle different situations. Because of their domestic and caring roles, women are the ones who face most difficulties when dealing with energy shortage. So, ensuring their control of energy in the household could best promote their empowerment (Bhagwat Nandan).

Teja Ram also shared a similar view.

The NGO has also been running a programme on women’s rights and empowerment beyond the solar programme. Through this programme, some women at the Barefoot College became involved in making posters on gender equality and women's empowerment to raise awareness among the local communities, and participated in rallies campaigning for women’s rights. The programme coordinator recognised that rural customs involve gender stereotypes with preconceived gender roles and responsibilities. For example, he said:

> [t]here is a strong bias that if men do women's work, they will become women. So, for example, if they carry water they will carry the bucket on the shoulders but not on the head, because that's what women do (Ramka

Ram).

He also added that these kinds of preconceptions are very difficult to change, “no matter how many times you tell people, only when they see something happening, then there is real change” (Ramka Ram). Perhaps, seeing women working as solar engineers within the villages show women’s capabilities and expertise, and that they are equal to men. Ramka Ram reported examples of male bias against women in the village. When they proposed solutions for a community matter, the men of the village ignored their suggestions. Only after the intervention of the NGO did the villager’s perception of women’s capabilities change. Similarly, customs are embedded in people’s everyday lives and there is evidence of these social rules among government schemes, with, in some cases, the exclusion of women from the job market (Agarwal, 1997a; Batliwala and Reddy, 2003; Clancy and Dutta, 2005). [91] This example shows that the intervention of the NGO, in this instance, has been extremely important to foster women’s empowerment; the organisation has been successful in this instance because it gained the trust of the villagers and, firstly, of the men of the village. Working as mediator among local villagers and institutions, increased women’s negotiation power in order to challenge male dominance (see Clancy and Dutta 2005 for a similar finding). Being closer to the community life, the College has been able to show that women are equal to men, to challenge preconceptions, and propose alternatives.

5.5.6 Challenges for the Solar Mamas’ programme

The NGO professionals that I interviewed recognised some problems, limitations and challenges that need to be addressed in order to improve the programme and further facilitate women’s empowerment process. A deep analysis of

[91] Ramka Ram also reported a similar attitude by government employment programmes, which, although open to everyone, were not employing women.

the solar programme reveals also other limitations that emerged from the participants' accounts and observations during the fieldwork. Reflecting on people's accounts and my observations, I selected critical themes that are shown in Fig. 19. Themes tied in with my framework are: 'the "traditional" family', 'enticing rural women', 'employment'; themes that emerged during my interviews are: 'stability of salary', 'satisfying communities' energy needs', 'affordability of solar cookers', and 'design of solar cookers'.

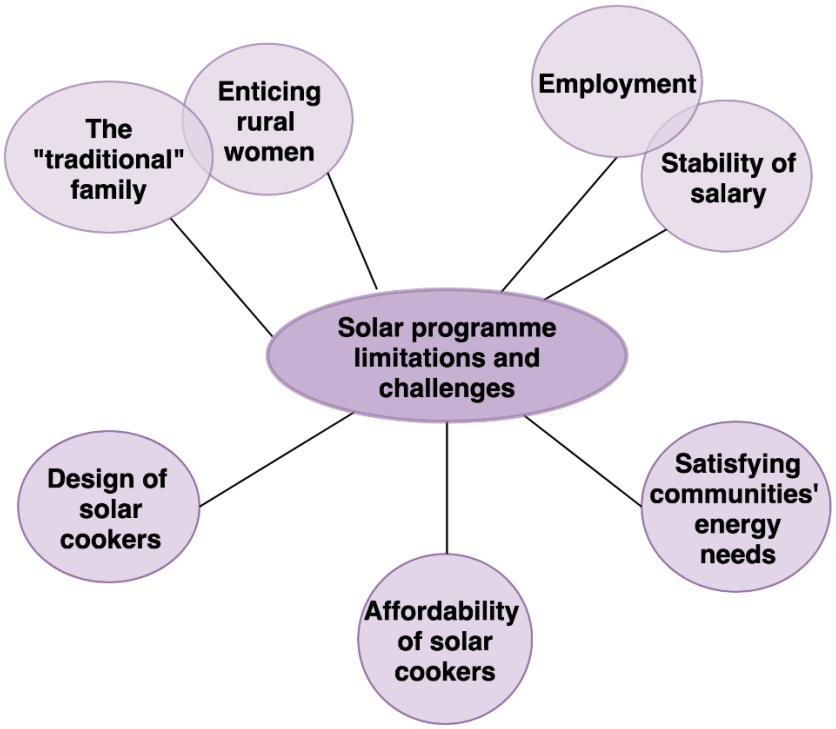

Fig. 19 Solar programme limitations and challenges

5.5.6.1 The 'traditional' family and enticing rural women

In conversation with the NGO professionals, Ramka Ram, the coordinator of the women's empowerment and rights programme, mentioned that one of the main challenges is the "traditional family". This theme is embedded within my framework. Connected to this theme, is that of 'enticing rural women'. This finding resonates with studies that highlight how local customs dictate women's position and condition in their family; therefore, many women remain marginalised within the domestic sphere

(Sharma, 2016). On this point, Mota Ram, the director of SARA, commented that one of the biggest challenges of the solar programme is “making the society change their view point. It is difficult to convince women to move out of their houses”. Similarly, Bhagwat Nandan said:

> [t]he solar mamas is the biggest change already. Here during the training there are no barriers: no gender-related, no religion, no caste, no law, this is the biggest change. Families are usually in control. Here, this is not replicated.

Most of the in-laws and husbands feel women’s roles and responsibilities, their position and condition in the society, as prescribed; therefore, they might refuse to accept changes in women’s autonomy, mobility and independence. These constraints operate in relation to not only gender, but also class, caste, status, and age. In the same vein, Pande (2017) discusses on how cultural norms can be strongly embedded in rural communities’ life. Clancy et al. (2012) suggest that on the one hand, men might be afraid of losing their authority and status; therefore, they might feel vulnerable to women engaging in modern energy technologies. On the other hand, women might be seen as lazy (e.g. by not using a wood stove) and are, therefore, afraid to challenge customs. In order to generate greater change, perhaps, development interventions should engage the wider household and raise their awareness.

5.5.6.2 Employment and stability of the engineers’ salary

These two themes are connected because ensuring the stability of the engineers’ salary influences the employment of the participants in the rural energy technology field. The ‘stability of the salary’ emerged as a theme from the interviewees’ accounts; it contributes specific insights by echoing some studies that see the lack of

female job stability in this field as a challenge in countries of the global south (e.g. ILO, 2015). When interviewing, Bhagwat Nandan, the solar programme coordinator, he pointed out how, working only for two years after the training could represent a challenge for the engineers' empowerment. He said:

> the engineers usually work for one to two years and then, slowly, slowly, the work is less. They are called on occasion to fix the panel or then to change the battery. The community interest become lower and the money in the [community] bank account finishes.

He also added:

> [o]ther opportunities to work are through a Government scheme through which people are guaranteed 100 hours of work per year.

It is interesting to point out that there are contrasting opinions related to the 'stability of the salary' because Don Ras commented that, "[u]sually women have other jobs too" and that "[t]hey [the participants] are employed by the organisation and paid the minimum wage. They also do other production work for the organisation". Teja Ram said:

> [t]he partner NGOs help the women to find work either than in the solar (e.g. handicrafts, animal husbandry) so women are able to earn more money.

Similarly, Mota Ram commented that, "the women are employed by SARA so they also do other work". However, perhaps, while Don Ras, Teja Ram and Mota Ram talk specifically about their NGOs, Bhagwat Nandan, being the programme coordinator

has, perhaps, a broader view of the issue. Clearly, though, the focus shifts from the employment in rural energy technology to the participants' employment in other fields.

Linked to the issue of the participants' employment, is that of the payment for the panels by the communities that affect the stability of the salary of the solar engineers. The solar panels are installed in the interest of the local communities who contribute a lump sum during the installation, and then pay the total amount due in instalments over a three-year period. The fees are used partially for the maintenance cost of the solar panels, and mainly to ensure a salary for the engineers. It is interesting to note that also on this matter there are contrasting opinions among the NGO professionals. Bhagwat Nandan commented, "usually, communities used to pay timely. Lately the NGO is facing some problems since the communities are not repaying". He added, "[s]ome families are not able to pay regularly since it depends on their income. Sometimes they pay after 6 months". In the past few years, it seems that there have been some problems with the payment by the communities; this has negatively affected the engineers who did not receive their salary. However, Don Ras said that "[t]here are no issues with the payment"; similarly, Mota Ram commented that usually "[t]hey [the communities] repay in one instalment".

As I discuss further in Chapter 6, it has happened that after the payment of the panels, some engineers did not receive a salary anymore since there were no other financial sources available through the solar programme. Therefore, those who have not been reintegrated in other programmes by the partner organisations lost their job. The lack of job security for women in the rural energy technology field is a challenge in countries of the global south and hinders the empowerment process of some of the participants in the solar programme (UNEP, 2011; ILO, 2015). Addressing these kinds of constraints is essential for gender and social equality. It is telling that some themes are both positive outcomes of the solar programme for some participants, and a challenge to their empowerment for others. Perhaps, a long-term strategy developed

by the engineers together with the NGOs could ensure their self-reliance and that of their communities through skills transfer for the promotion of livelihoods activities. Such a strategy, as Haines (2009) and Kilby (2011) advise, could include networking, mapping of the assets within the community, and providing the engineers with leadership skills in order to reduce the dependency from NGOs. Additionally, these kinds of strategies, could equip the SEs with those competences that can support them in their transition from the College to the rural energy job market and to triggering women's agency to create greater transformation in their lives.

5.5.6.3 Satisfying community energy needs

The interviewees' accounts point out the need of providing local communities with adequate energy services that can facilitate productive activities. This theme emerged from the participants (as discussed before) and the NGOs professionals' accounts. My findings bring specific insights from the solar programme considering that the availability of affordable, clean and reliable energy services is recognised internationally as essential for people's human, social and economic development (IEA, 2018).

While talking with the NGOs representatives, Bhagwat Nandan commented:

> [m]ost Rajasthan is electrified nowadays. Now the College is only reaching the remotest hamlets. The focus now is to raise awareness that solar can be used anywhere, in farms, and so on. Politicians in Rajasthan promise free stuff but actually this cannot happen.

Teja Ram said:

> [t]here are hamlets of 20-50 houses that are really remote and are not

> electrified by government programmes. The light provided by the solar system satisfies their basic electricity needs. The villagers can say that they have something at least.

However, Don Ras pointed out that, “when villagers have the solar light bulb then they ask for more. They would like to have a fan and so on”, and that “[t]he only problem is with the capacity of the panels. People would like to have bigger solar panels”. As discussed before, the capacity of the panel is quite limited. Maybe, in order to contribute to the sustainable development of rural off-grid communities, the College and the partner organisations should envisage a long-term strategy to ensure the continuity of women’s work and suit community’s needs. Questions arise in regard to the feasibility of providing more powerful energy systems by the College due, for instance, to issues of cost. Additionally, it is also questionable whose responsibility it is to provide these kinds of services in areas not served by the main electricity grid and whether it should be the Government’s.

5.5.6.4 Affordability and design of solar cookers

In conversation with the participants in the solar programme, and from my observations during the fieldwork, two main constraints on the application of solar cookers emerged. These partially curtail the ‘effective’ empowerment of women who use them, and the economic empowerment of the SCEs. It appears that the design should be improved to make it more user-friendly (for instance smaller) as also discussed by Cuce and Cuce (2015). There are also problems in relation to their affordability by the rural poor to encourage their use by local families. This theme is also discussed in other studies as a barrier to their adoption (e.g. Baruah, 2015). However, encouraging the extensive use of a clean cooking solution would respond to broader human nutritional and health needs (through the elimination of soot and

smokes) and environmental concerns such deforestation and the production of noxious smokes. I discuss the limitations of the SMs' programme further in section 8.3.

Having recognised these limitations, the NGO has started, in collaboration with the partner NGOs, a series of workshops for the SMs on entrepreneurship and livelihoods to start activities locally (Barefoot College, 2015e). However, further research on the ground will be required to evaluate the effectiveness of the complementary programme offered by the College. For instance, the College Annual Report (2014-2015) highlights that:

> [t]he training in Solar Engineering is today complemented by other livelihood solutions such as rainwater harvesting, environmental awareness and an additional curriculum which is been prepared and seeks to capacitate our trainees in entrepreneurial skills, building on their knowledge as well as key livelihood activities that can be locally implemented (i.e. bee keeping, mosquito nets and eco-friendly sanitary pads) creating solutions that combine the creation of economic and environmental sustainability (2015a).

There is thus evidence of the organisations willingness to address those challenges that might hinder the empowerment process of rural women and the development of local communities. This flexible approach, while challenging the dilemma of creating community dependency on the NGO, enables women's agency and leadership in the use of energy sources according to their needs and priorities. It would be interesting to explore further what has been achieved so far and how the programme has changed to further support women's empowerment in rural Rajasthan.

5.6 Summary

My findings show that there are gender differences in energy access and

benefits, which are dictated by gendered responsibilities, roles and relations within the household and at broader scale. They also indicate that that access to small-scale energy solutions (SHSs for lighting and solar cookers) supports the satisfaction of material needs (e.g. health, nutrition, financial) and eases women's workload. Thus, energy access can benefit attaining functioning achievements that reflect 'effective' agency by women within set gender roles, and which contribute to their 'effective' empowerment (Sen, 1987; Kabeer, 1999b). The interviewees' accounts suggest that access to energy also supports satisfying strategic gender interests and needs such as increased safety and mobility.

My findings indicate that the absence of the in-laws' facilitates their participation in decision making on the use of resources. However, they also show that participants' status influences their gendered roles and responsibilities within the household. It appers that daughters-in law are more so in charge of cooking and relative activities than mothers-in-law, and that the interviewees' age might influence their cooking habits (e.g. in terms of using gas over firewood). The findings also show that, perhaps, the participants' age and having school-age children influences their engagement in educational activities.

However, as Clancy et al. (2004) suggest, it is evident that access to energy per se does not generate 'transformative' empowerment, and it is necessary to provide communities with energy to satisfy their productive use and their needs. My analysis suggests that while energy access contributes to the improvement of the living conditions of local women and their communities, it is also critical to recognise multiple levels of energy access. This insight emerged during the interviews, and suggests for development interventions on energy to take into account communities' energy needs for their further development. As my findings suggest, there are instances in which access to light is not enough to support revenue activities that require a large amount of energy.

In relation to the solar cooker's programme, improved clean energy cookers have been deemed beneficial for women's lives and their families for different reasons, some of which I discussed in this chapter. There is evidence of discrepancies between theory and practice at a grassroots level because it appears that the adoption of these kinds of technologies face constraints due to, among others, cultural norms and customs. In response to these limitations, the College has acted as facilitator by supporting local women's collective agency in building the *chullah* stoves, and by adopting an innovative approach to sell the parabolic cookers to local institutions. Women, those living on campus and the SCEs, are seen as drivers of change in their communities. This challenges the vision of rural women as beneficiaries of interventions and as dependent on NGOs. This is evidence that the engagement with the NGO has been essential to facilitate the 'transformative' empowerment of those women who are engaged with the College, and especially for those who live on campus. The locality and the long-term involvement of local women within the solar programme has been important for their empowerment process.

I suggest that the innovative marketing strategy of using parabolic cookers in public offices (including schools, hospitals, and so on) responds to nutritional needs in rural areas, therefore, broadening the impact of such technologies. It would be interesting to explore whether this approach could be adopted internationally in response to global goals seeking equality, good health and wellbeing, and the use of appropriate clean energy (IEA et al., 2018; UN, 2015: SDGs 2 and 3). Additionally, I suggest that an analysis of the social fabric of households and the community should supplement development interventions on energy provision in order to uncover social inequalities and differences in energy access, use, and the benefits deriving form services, and to facilitate challenging these constraints to encourage women's empowerment through energy use.

Chapter 6. The role of training on rural energy technology in promoting women's empowerment

6.0 Introduction

Development literature often depicts women as victims of inequality while development programmes frequently exclude them from participating in energy technology training and from the energy job market (Cecelski, 2000). Questions arise about the role of NGOs in facilitating the empowerment of marginalised groups such as rural women through training in energy technology. In the specific context of rural Rajasthan, which is shaped by the intersectionality of poverty, patriarchal rules, and religious norms, additional elements other than training need to be in place in order to facilitate women's empowerment process through energy technology.

In this chapter, I discuss the findings from the interviews with the rural women participating in the solar programme of the Barefoot College. I apply and mobilise my conceptual framework to analyse whether and how participating in the training and the engagement with the NGO facilitated the participants' 'effective' and 'transformative' empowerment and contributed to the achievement of their needs and interests. My analysis suggests that their engagement in the energy programme, working as Solar Mamas, and, especially, the life on campus, contributes to women's empowerment while influencing other spheres of their lives. The exposure to technology innovation, living on site at the College and the engagement with women from different countries are key to complementing the training and supporting women's agency in subverting their condition and position in the society. The findings also reveal how training in energy technology is particularly suited to develop rural women's entrepreneurial skills and open new opportunities in the energy job market, as discussed in the Introduction.

In the first sections of this chapter, I discuss women's accounts of their engagement in the SMs' training and what their expectations were prior to joining it.

My rationale is to uncover instances of women's agency and freedom of choice to participate in the training and their motivations. The findings highlight women's position and condition within their households and community prior to the training. In section 6.3 and following, I discuss the significance of the solar programme in women's lives. The findings show that there are outcomes that directly relate to the training experience and the engagement with the NGO. In section 6.4 and following, there is indication of specific outcomes from training in rural energy technology and the practice. These relate to women's acquisition of competitive skills and knowledge that facilitate their integration in the rural energy technology job market, therefore challenging gender stereotypes of the division of labour and competences. Learning about and engagement in energy technology encourages women's entrepreneurship and transform their status to a higher one than before. In addition, informal education and the engagement with international women promotes collective agency and has intragenerational and intergenerational outcomes. As mentioned in Chapter 4, since I adopt an intersectional approach to the analysis of the findings, I took into account women's age and status (e.g. widow, ML, and DL) in order to gauge whether these influence their empowerment process.

6.1 Women's engagement in the solar training

As discussed in Chapter 4, the themes that I discuss in this and the following section either resonate with, contrast with or contribute new insights to what is discussed in the literature on women's empowerment in development and GED. A few themes emerged from my analysis, and some of them have sub themes, as shown, for instance, in section 6.3 in Fig. 21. I discuss some themes in the same section because there are overlapping findings. Fig. 20 below shows the themes I discuss in the following two sections; they are tied in with my framework.

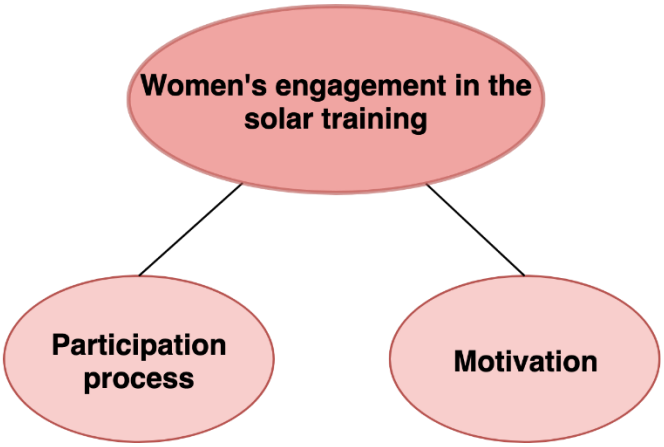

Fig 20. Women's engagement in the solar training

6.1.1 Women's participation in the Solar Mamas' training

This and the following section are tied in with my framework when I discuss women's freedom of choice because they assess whether it was the participants' choice to engage in the training and what their underpinning reasons were. As explored in Chapter 2, many women living in rural areas are in a position of subordination that affects their freedom of choice; therefore, it is interesting to find out how and why they got involved with Barefoot College. Was it their choice to join the training, and why? Freedom of choice contributes to peoples' human empowerment and development (Kabeer, 2002). My rationale is also to understand whether there have been changes after the training in regards to the participants' freedom of choice, as I explore later in the chapter. My findings contribute insights on the participants' engagement process and the motivations that lay behind them, specifically in consideration of the socio-cultural context of rural Rajasthan.

In conversation with the SMs, it became apparent that 12 out of 14 among the STs and the SCEs moved from their home villages (some are close by, others are further away) to live on campus or live in nearby villages. Thirteen among all the participants (32 interviewees) became engaged in the programme because they had

already received training in other activities at the College or their husbands were involved in the organisations. There is evidence that, having members of the family already engaged with the NGO, further supports the transition of these women from their villages to the College. A teacher, for instance, said:

> I wanted to leave the village and move to the Barefoot College where there is a strong community, everyone helps each other and we are like brothers and sisters (Divya, 30, no IL).

Similarly, a SCE commented, “my husband was already working at the NGO, he was understanding. Here there is no discrimination and everybody works together” (Chandra, 42, lives on campus). However, she added, “village people were not very supportive about it. But my husband and I didn't care”. These quotes highlight that, having other members of the family engaged in the process made the transition from the villages to becoming an engineer easier. The College or a partner organisation involved seven SEs after a visit to their village. Others SEs have known about the programme in different ways, such as by word of mouth, by attending night schools or women’s groups. All the NTs (three) received a visit from NGO representatives. One of the NTs, for example, said:

> other women of the village were not keen on participating in the solar programme because they, and the other villagers, did not understand what the programme was about and what the organisation does (Aditi, 37, no IL).

Strong cultural bias permeates the rural areas in Rajasthan where communities probably still prefer ‘traditional’ activities that they are more familiar with, and which tend to marginalise women within the domestic realm. There is evidence that the

facilitating role of the Barefoot College is key to reach out to the remotest areas and to engage with women in training and employment opportunities in the energy sector.

Since empowerment, as defined by Kabeer, entails an expansion in women's choices, it was relevant to investigate the extent to which women's choice to get involved in the solar programme was their own, and whether their family and community were supportive (2002). Among 20 interviewees who said that it was their choice to get involved, eight said their family members supported their choice to join in. In particular, four engineers, one NT and one SCE had to bargain with their families that opposed their choice. One SE, for instance, said, "my family wasn't happy about me having to travel far to Tilonia" (Sameena, 20-40, DL). Another commented on her negotiations with her family and the villagers:

> the community wasn't supportive since they said that I would get spoilt and have a loose character. My father-in-law, however, is an educated man and wanted me to go and work so that I would keep well and I would be fine. My mother-in-law wasn't very keen and I had to face lots of opposition and listen to lots of things (Madhu, no info, widow, DL).

In the same vein, a SCE said, "initially I had some issues with my family since my personality was changing and my lifestyle as well" (Gangi, 35, DL).

It is argued that patriarchal norms give the men the right to decide upon women's mobility outside the household, therefore determining whether they could be involved with the NGO (Mathur, 2004). Intrahousehold negotiation processes shape women's freedom of choice to participate in the public realm (Agarwal, 1994b; Kabeer, 2001). Nevertheless, this quote highlights how women's empowerment process is constrained, not only by their gender, but also by their status within the household. I am referring to the roles and responsibility, and the different levels of authority of

women in their family depending on their status. In this case, for example, mother-in-law versus daughter-in-law, which perpetuate their subordination. In some cases women's mothers or sisters'-in-law had to take on the participants' duties (such as cleaning, cooking and caring) while they were training at the College. Maybe these kinds of customs are difficult to challenge because they require long-term interventions to challenge people's mindset in areas permeated by strong traditions, as Batliwala and Reddy (2003) also suggests. Women's power of negotiation within and outside the household might be very limited in comparison to their in-laws' or husbands' (Folbre, 1986; Kandiyoti, 1988; Agarwal, 1997b). There is no evidence that their age influenced their participation in the SMs' programme.

My analysis of equality has extended beyond gender differences because, as Kabeer points out, there are cases of "oppressive exercise of authority by mothers-in-law over their daughters-in-law (a problem often identified in the South Asian context) [; this is an] example… of how women's behaviour may undermine the well-being of other female members of their family" (1999b:7). It is evident that their husbands and family pressured some women to join the training; others were keen to participate in it. Whether an economic opportunity was the driving reason for the husbands to allow their wives outside the household, or whether there were other reasons, it is difficult to say. I suggest that maybe allowing their wife to participate in the training has been an acceptable compromise for them due to the meagre conditions in which some of these families live. As explored in previous chapters, in rural areas of Rajasthan, women live subjugated by family constraints that prevent them from freely expressing their opinions and inclinations, and which impinge their mobility in the public sphere (O'Reilly, 2006; Pankaj and Tankha, 2010; Duflo, 2011; Singh and Kumud, 2013).

6.1.2 Women's motivations to join the training

I asked the participants about their motivations for getting involved in the training. Income opportunities, learning new skills, employability and financial independence were the main reasons for women to join the training programme offered by the Barefoot College. I also discuss other reasons in this section. In particular, an engineer said:

> [t]wo women were chosen in every village. I was selected since my husband allowed me to go to do the training. Other husbands didn't allow their wives to go (Saumya, 30, DL).

This is an example of how local customs in rural Rajasthan see women relegated in the domestic sphere, and patriarchal norms see the men in the household as those who take decisions on behalf of the women, as also discussed in the previous section. These kinds of rules are often difficult to challenge. The quote also points out that some women are chosen to attend the training. This is usually done by the elders in the community. Perhaps, the intervention of the NGO supported breaching these social constraints by, as Kilby (2011) suggests, balancing power relations within rural families. The NTs commented that they were keen on bringing light back to their villages. This finding is indication that the engagement in energy technology training is a promoter of women's empowerment. Aditi, one of them said, "I saw in the training a great opportunity for employment and to learn new skills; this is why I was keen on getting involved" (37, no IL). Another saw the training and the campus life as a space for socialisation, for escaping isolation, and to feel useful for her community. She commented:

> my sons and daughters are married and they work away. They don't come

> often to see me, so I feel lonely at home alone all day since I am a widow. When I was at home, I was praying the Gods to take me away (Prestha, 55, ML).

As I discuss further in the next sections, this quote is evidence of women's marginalisation and isolation in rural areas, independently from their age and status (e.g. ML versus DL); moreover, this participant's assertion suggests that being engaged in the training would support her copying with her life and give her hopes for the future. Prestha is one of the oldest engineers and she is a widow, she seeks recognition for herself and her contribution to the community. Batliwala and Reddy (2003) and Batliwala, (2015), highlight how women's support to their community is often ignored or taken for granted because it is seen as part of women's duties. This feeling of personal fulfilment positively affects women's self-confidence and esteem and resonates with a theme in GED literature (Clancy and Dutta, 2005; Karlsson, 2007; Clancy et al., 2012).

There is a tradition of strong discrimination and marginalisation of widows in rural Rajasthan due to cultural beliefs and customs that see them as responsible for the husband's death (Torri, 2010; Dasgupta, 2017). This brings further attention to the issue that in these areas women encounter multiple constraints on their empowerment. Talking to the interviewees emerged that four of them are widows; given strong biases against their status, the intervention of the College is essential to foster their social integration and equality. Two SCEs (35, DL and 38, lives on campus) in particular felt that challenging the *purdah*, engaging village women, and promoting gender equality in the rural energy job market were at the heart of their decision to become involved with the training. One, for instance, stated:

> I want to make women more autonomous and involve more women from

> the villages. If I can do it, more people can do it and will be encouraged to do it (Gangi, 35, DL).

Similarly, a teacher commented: “[w]omen in villages have to respect modesty and the *purdah*, for how long women have to do that? I needed to do something” (Shahana, 50, ML). Being able to get better health care was a concern for a SCE; she said:

> I had two miscarriages. I wanted to get health care with my salary, have a salary and a house on my own with my husband. After the training, I got pregnant and now I have two kids (Sonali, 28, lives on campus).

There is evidence of women’s awareness of their condition and position in the rural Rajasthani society, along with their willingness to challenge stereotypes and traditional rules. There is also indication of women’s desire to change theirs and the situation of other women who are still marginalised in the villages.

6.3 Implications of the Solar Mamas’ programme for women’s lives

6.3.1 Solar Mamas’ perception of their empowerment

In this section, in conversation with the respondents, I unfolded their perception of their empowerment. To what extent did they start questioning their condition and position in the society? Under the pressure of the socio-cultural norms and constraints my findings suggest that to start alone on that conscientisation process leading to their empowerment can be challenging for illiterate and marginalised rural Rajasthani women. Therefore, engagement in the solar programme and in the College life is central to supporting the women’s empowerment process as I discussed in the Introduction.

Reflecting on women’s own perception of empowerment allowed me also to

identify critical outcomes or themes, and sub themes, from their engagement in the solar programme. Some of these outcomes overlap and interrelate with my conceptual framework, while others might contrast or contribute new insights. Fig. 21 shows the themes.

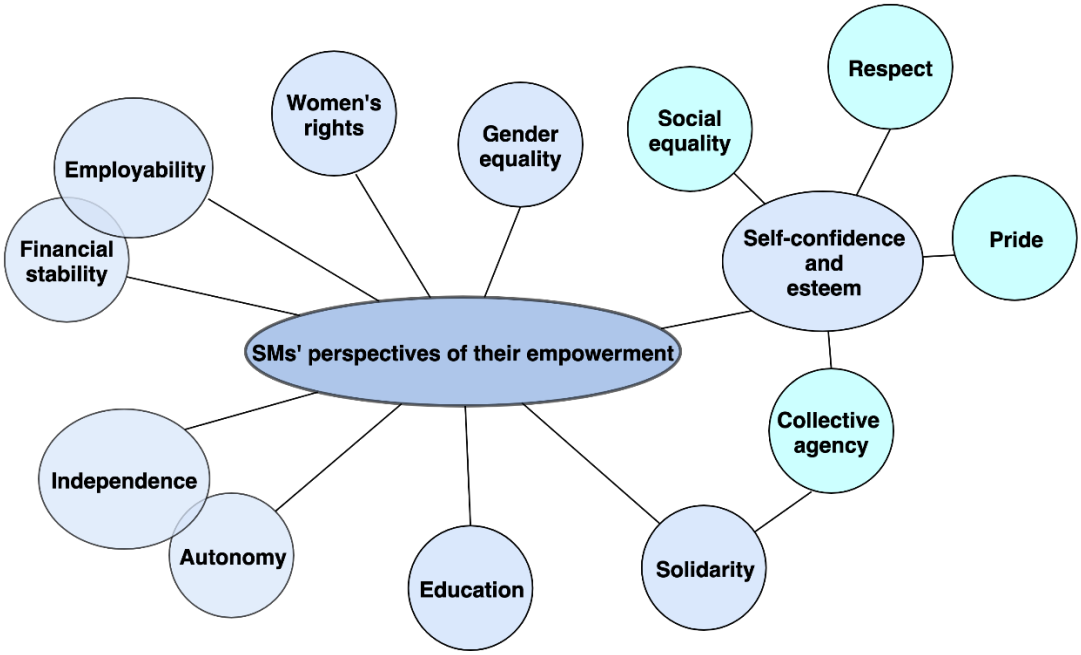

Fig. 21 Solar Mamas' perspective of their empowerment

Financial stability and employability

From the analysis of the respondents' accounts, it emerged some women's awareness of their employability after attending the training. They are aware of the skills they have acquired and they are focusing on engaging in activities outside the household. This is a critical finding the context of rural Rajasthan where many women are marginalised within the domestic sphere, and shows their willingness to challenge their status. When I asked about their conceptualisation of empowerment, three (50, ML; 50, lives on campus; and 40, ML) of eight STs, six (25, DL; 40, DL; 40, DL; 35, DL; 30, DL; and 43, separated) of 13 SEs and one of the SCEs (45, lives on campus) said that the achievement of economic stability are elements of their empowerment. Binita (50, lives on campus), a teacher, for instance, commented:

> women don't have to ask for money to their husband. I am confident and smart. As both husband and wife are earning, it adds lots of value since things are getting more and more expensive.

Similarly, a SE said, “I would be independent and I won’t have to beg for money to my husband” (Pooja, 25, DL). Prisha (35, DL), another SE, commented, “[m]en usually drink and behave badly; with my income I can look after my children. Having an income makes women more independent”. In the same vein, Rashmi (45, lives on campus), another SCE, commented, “I can take care of my children”. These quotes highlight the participants’ willingness and capacity to look after their families financially; this independently from their age and status. They also resonate with some studies that discuss how issues of violence against women (VAW) are frequent in India and that having an income can contribute to women’s independence from their family (e.g. Kabeer, 1999b; Radah, 2019; Richardson et al., 2019).

A SCE highlighted that participation in the solar programme and possibility of being employed afterward show that “women can work” (Sonali, 28, lives on campus). This suggests a level of awareness that, women do not have to be relegated to the domestic sphere and that they are employable, echoing Batliwala and Reddy (2003), and Clancy et al.’s (2004; 2012) claim. With suitable training and exposure to the rural energy job market, women are able to fulfil the requirements of employers and to generate income for themselves and their family (Clancy et al., 2004). This awareness is important in a context or rural marginalisation to challenge subordination.

Sameena, a SE, commented, “[w]omen should pay attention to work outside the house since they tend to focus on working in the house only” (20-40, DL). Pankaj, for instance, discusses that in certain rural areas of Rajasthan there is the belief that, “allowing women to work outside their home would amount to a loss of honour and

dignity of the family" (2010:48). My analysis show evidence of the interviewees' questioning and challenging constraints on their empowerment dictated by local customs and norms that impinge their participation in the job market. This shows a level of 'transformative' empowerment for the achievement of their productive needs and interests since they seek financial independence and employment opportunities.

Women's rights and gender equality

While interviewing the participants, they showed awareness of their rights as women, of the need to pursue gender equality and of challenging socio-religious customs, such as the *purdah*. The latter brings particular insights to women's empowerment in development literature because reflects specific features of the rural Rajasthani socio-cultural context. Three STs (52, ML; 30, no IL; and 35, DL) of eight referred to the recognition of women's rights; two SEs (27, DL, and 20-40, DL) of 13 mentioned the achievement of women's rights and gender equality, other three (25, DL; 35, DL; and 43, separated) also cited the ability to challenge VAW, as aspects of their empowerment. Two SCEs (42, lives on campus; and 38, lives on campus) of six, and one SCW (no info, no IL) also referred to the recognition of women's rights and equality. Shwati, a ST, for instance commented:

> [w]omen should definitely have equal rights with men. I feel that while there has been some progress, for example, women would go for vaccinations for their children and themselves, and they have started to go out of the house to do something for themselves, there still is a long way to go. Most of the work in the rural areas that women do is outside in the farm and then at home. The amount of work that they do is much more than what men do. In terms of rights they don't have that many. I talk to women and I tell them that they must ask for their rights, and that they must have equal rights (35,

DL).

This quote indicates the participant's awareness that women's contribution to the household management is taken for granted and is undervalued; it also shows that there are gender inequalities in terms of the workload (women tend to work more than men), as explored in Chapter 2. An engineer said:

> the expenditures should be shared. The financial conditions will improve and overall it would affect the standard of living of the house. Definitely, both husband and wife will live as partners (Pooja, 25, DL).

This quote highlights the multifaceted aspects of the respondent's perception of her empowerment, including gender equality, improving living conditions and financial independence. Krisha, another SE, commented, "women should be equal to men, should talk about, and find ways to get their rights" (27, DL). Sameena said, "[w]omen should get an interest, and they should have equal rights" (20-40, DL). This suggests participants' awareness of their position and condition in their society. While development literature tends to portray women as victims due to their presumed unawareness (as discussed by, for instance, Sen, 1999; Kabeer, 2000b; WomenAction, 2000), Clancy et al. (2004) suggest that, with suitable advocacy and capacity building it is possible to raise women's consciousness about other options.

Five women (35, DL; 42, lives on campus; 45, lives on campus; 52, ML; and 43, separated) mentioned that they had to challenge the *purdah* and similar customs. A teacher, for instance, commented:

> I stopped wearing the *ghagra* and opted instead for a *saree*.[92] The latter is more neutral and does not reveal which community I belong. I am happier at the College (Jaya, 52, ML).

Similarly, an engineer said that:

> I challenged social norms since I separated. I work with men, I don't cover my head with the *palluh* and I take lifts on the motorbikes.[93] People point the finger at me (Noor, 43, separated).

Diya, another SE revealed a negative perception of being a woman, and of women's position and condition in their daily lives; she commented, "no-one should be a woman, women are very sad and upset" (30, DL). This quote is indication of women's marginalisation and subordination status in rural Rajasthan. It has been interesting to compare the findings of the STs, SEs and SCEs with those of the NTs, who just joined the organisation, and the SCWs that have had limited engagement with the Barefoot College. While Aditi (37, no IL), one of the NTs commented, "women should have equal rights to men and employment opportunities as well", the other two trainees did not comment on it. Also of the two solar cooker workers, one was aware of social inequality but could not elaborate what it does imply in women's lives.

My analysis suggests that there are instances of women's 'transformative' agency and willingness to challenge constraints on their empowerment, such as the *purdah*, isolation, and social inequality. These are examples of how the interviewees challenged the patriarchal ideology against women that Agarwal (1997a) refers to,

[92] The *ghagra choli* is a traditional dress of north India that women belonging to the same community wear together with the same accessories. A *saree* is a female garment draped around the body.
[93] The *palluh* is a veil that women use to cover their heads and face in front of men and the elderly.

which establishes what is legitimate or not for women to do, wear and say in the public realm. Feminist scholars discuss how, in a society such as that of rural Rajasthan where intersect multiple constraints on women's empowerment, including poverty, gender, religion and discriminatory local customs, it could be challenging to overcome cultural norms (including, Agarwal, 1997a; Kabeer, 1999b; Cornwall, 2003). There is evidence of the participants continuous bargaining, independently from their status and age, which entail women's strong self-determination and initiative. It also shows a degree of conscientisation and of 'transformative' empowerment to achieve strategic interests, such as equality and autonomy. Participants in the programme have been able to elaborate their own conceptualisation of 'empowerment' and make some choices according to this. As such, I suggest that their empowerment has not been "given", as a top-down approach, by the NGO, but participants have been able to decide upon their own empowerment. Given the strong biases and cultural customs that operate against women and girls, it can be argued that engagement in the solar programme of the Barefoot College, and the life on campus, are critical in supporting challenging preconceptions and facilitating women's increased autonomy within their community.

Self-confidence, solidarity, and education

As shown in Fig. 21, as an outcome of their empowerment the respondents spoke about increased self-confidence and esteem, and solidarity with other women. From these critical themes, some sub-themes emerged during the interviews; collective agency is interrelated with both main themes. Collective agency and feeling of pride are themes that emerged during the interviews; they contribute specific insights in recognising the participation in the training as a catalyst for women's awareness of their power to act as ambassadors and entice other women. This is 'transformative' in a context where many women find themselves in a condition of

marginalisation.

In conversation with the interviewees about their perception of empowerment, four participants mentioned increased self-confidence and solidarity as aspects of their empowerment. Seven out of eight STs, 10 out of 13 SEs, and six out of eight SCEs and solar cooker workers declared that their self-confidence and esteem had improved as an outcome of the engagement in the training and with the NGO life. The NTs also felt their confidence was already increasing. The interviewees perceived themselves to be, to a certain extent, equal to other members of their family and community after the training. Participants commented that the engagement with the NGO positively affected their status since their families, husbands and community respect them.

Two STs (52, ML and 30, no IL) said that they feel powerful; one, for instance, commented, “I feel a sense of power and confidence in myself (Divya, 30, no IL). In the same vein, two SEs expressed their feeling of pride; one, for example, said, “I feel proud of myself” (Megnaa, 38, no IL). In addition, one teacher commented, “I feel proud that I have been teaching to more than 100 foreign women” (Shahana, 50, ML). A SCE said, “I can fulfil my wishes, and my husband treats me better now” (Chandni, 38, lives on campus). These are new insights that emerged during the interviews and that show significant aspects of the interviewees’ empowerment, such as that they have wishes and dreams that they feel they can now fulfil. A teacher, for instance, said that for her empowerment is about:

> […] knowing women's rights, being educated, and achieving financial stability. It's not about one woman only; it needs to be done together with other women, collectively. It means many things: it means money, education, looking out for each other, and all working together to move forward. Not just only one person (Shahana, 50, ML).

Shahana's view of empowerment is about women's rights, education, financial stability, solidarity and collective action to achieve greater goals. Similar to the example cited by Clancy et al. (2004) about the energy programme in the Bulelavata village in the Solomon Islands, as an outcome of their engagement in the SMs' programme, the participants developed strong bonds and a sense of solidarity amongst each other. Shahana is aware of the issue that there is more progress to achieve in terms of gender and social equality, and that advocacy and collective action could generate change. It seems that the interviewee envisages collective agency as a way to overcome women's oppression and challenge societal and institutional barriers, among others. This outcome emerged during the interviews and resonates with what previous studies suggest, such as that, group action can contribute to achieving greater 'transformative' empowerment because it is a stronger form of agency that can support challenging and reframing structural constraints (Kabeer, 2003; Batliwala, 2015). Divya, another ST, stated:

> [b]efore I didn't even know that there were these things that I could do. I want other women to know that to work is good because you can have your say, your independence, you can make money, and you know. I feel powerful and confident; on campus, I live with my daughter, before with my in laws I had to look after 15 people (30, no IL).

Divya's comment highlight that she was bearing gendered responsibilities when she was living with her in-laws, and how these constrained her status and condition within her household. It also shows her awareness that these can be challenged, for instance, by engaging in development interventions such as the SM's programme. Perhaps, living on campus or being a ML influenced participants' perception of what they are allowed to do and wish for, as some of their accounts reveal.

The interviewees' answers elucidate instances of agency when they, having gained more self-confidence and esteem, became outspoken and ventured into new experiences. From their quotes, it appears that the engagement in the training has been a catalyst for their collective agency. For instance, two teachers (52, ML, and 30, no IL) and three engineers (20-40 DL; 25, DL; and 40, DL) reached out to other women and told them how, participating in the solar programme and the work of the College, has paved the way for their empowerment. A teacher, for example, said, "I helped SARA to make posters on the solar programme training that are used in the local workshop so other women can get involved" (Jaya, 52, ML).[94] Another (30, lives on campus) wanted to speak to children about the benefits of solar energy. Two STs (50, ML, and 27, lives on campus) referred to increased education for themselves and their children as elements of their empowerment. These findings are evidence of how, engagement in informal educational programmes can have some intragenerational and intergenerational outcomes that affect, not only the women involved, but also their children as I discuss in section 6.4.1 and in Chapter 7. This suggests that greater transformation takes time and highlights the temporality aspect of empowerment as an ongoing process. As discussed in Chapter 2, the lack of female role models and the lack of recognition of women's contribution to their communities is considered one of the constraints on women's empowerment.

The findings suggest that the Solar Mamas acted as ambassadors of their empowerment trying to encourage other women to transform the social fabric of the rural Rajasthani society. After the training, their self-confidence had increased to the point that they felt exemplary to other women and capable of learning and doing. In Kabeer's (2002) eyes, one of the dimensions of empowerment is agency, which can be expressed as a thought through action or as an intellectual and personal process (e.g. bargaining). My analysis suggests that the solar programme contributed to

[94] As mentioned in Chapter 4, SARA is a partner organisation of the Barefoot College.

women's 'transformative' empowerment and the satisfaction of their productive and strategic gender interests in that they started questioning their realities and exercising a form of collective and individual action or 'power from within' (Kabeer, 2002). The interviewees' ability to act upon their lives and show self-determination represents a deep form of empowerment. From being marginalised within the domestic sphere, following the *purdah* and other local customs that reinforced their subordination, the interviewees engaged teaching and demonstrating to visitors, volunteers, foreign women and schoolchildren. Hence, there have been positive changes in terms of challenging inequalities rooted within social norms and rules within their families. These findings suggest women's suitability to engage with other women since they bond by common struggles and experiences in their everyday practices. The achieved independence allows them to venture as representatives of change within their communities, to creatively perform according to their own perception of what is useful to other women and to their community, and to develop these strategies on the basis of their own cognitive processes.

Autonomy and independence

These themes intersect with my framework and I selected them because the women's accounts contribute specific insights on women's empowerment in development and GED literature. The findings show discrepancies among the participants that highlights the essential role of the Barefoot College in facilitating the STs and SCEs 'transformative' empowerment compared to the SEs, particularly regarding their achieved mobility and independence. The findings also show distinctive outcomes related to training in rural energy technology that challenge prescribed gender knowledge domains.

When talking to the participants, two STs (30, No IL; 52, ML), four SEs (25, DL; 38, no IL; 40, DL; and 43, separated), and four SCEs including a worker (35, DL; 45,

lives on campus; 38, lives on campus; and no info, no IL), referred to empowerment as increased autonomy, in terms of mobility, and independence, in terms of their freedom of choice and legitimacy. As discussed in the framework, these are key themes linked to women's status as subordinate and their marginalisation. A teacher, for instance, said:

> [b]efore in the village with my in-laws I had to stay in the house. Now at the College I am free to roam. When I go to visit my in laws, I am not allowed outside the house (Divya, 30, No IL).

This teacher's account is testimony to the level of freedom in terms of mobility and freedom to choose, and equality she achieved by living on campus. Yet, it also shows how difficult it can be to challenge social customs when dealing with the dominant patriarchal culture outside. I suggest that the campus is a physical 'space for manoeuvre', which is safe and egalitarian, and which facilitated women's empowerment. Similarly, another teacher commented:

> [t]raditionally in Rajput families women are not allowed to leave the house, not even to fetch water. Since there were many restrictions in my life, I wanted to learn, and to have a job, I got involved (Jaya, 52, ML).

In the same vein, one of the SCWs said:

> I feel good, I feel very interested in doing many activities that other women in the village are not allowed to do; they are not allowed to move out (Sonia, no info, no IL).

Binita (50, lives on campus), a ST, added that now she goes frequently to Delhi and Jaipur, and she travelled internationally to Zanzibar and many other places. Five of six SEs who commented on changes in their autonomy, in terms of their freedom of movement and independence, said that this has improved. In particular, one of them said, “I go out of the house more often” (Sameena, 20-40, DL). Similarly, another engineer commented, “I finally go out” (Krisha, 27, DL). Additionally, one of the NTs (37, no IL) was appreciating that at the College she feels more autonomous as she does not have to ask for permission to anyone to move around. One commented that it has not changed (23, DL). Four of eight SCEs and SCWs said that they feel more independent and autonomous in terms of moving around without having to ask for permission (42, ML; 28, lives on campus; 38, lives on campus; and no info, no IL). Talking about what ‘empowerment’ meant to her, a SE stated, “women should go out more; it empowers them to become independent, bolder and more confident” (Gangi, 35, DL, lives on campus).

I also investigated changes in participants’ independence, in the perception of their legitimacy, in their ability to choose, and in the kinds of choices they have made. Greater transformation happened for the STs and the SCEs compared to the SEs. Two teachers (30, no IL, and 50, ML) commented that they have a say on issues now. Another teacher emphasised, “I don’t have any restrictions here, I am free to make my own choices in my daily life” (Shikha, 27, lives on campus). However, for four teachers (52, ML; 35, DL; 40, ML; and 27, lives on campus) there have not been many changes; two of them, in particular, said that either they consult with their husbands (40, ML) or that “bigger decisions are taken by the elders” (Shwati, 35, DL). Substantial changes happened for the SCEs since all of them said that their freedom of choice has increased. For the SEs, the findings reveal different outcomes. Three engineers (27, DL, and 52, ML; 38, no IL) said that there have not been many changes, while another, for instance, commented:

> I cannot think about an example specifically, but there has been a change after the training. Since I have spoken and met many people now, it made a difference in the way I think (Sameena, 20-40, DL).

This quote highlights a process of awareness raising or conscientisation in that the respondent now has different perspectives from before. Pooja (25, DL) said, “I chose what job to do”, while Krisha (27, DL) said, “there haven’t been that many changes, but I got an opportunity to grow and to do what it is traditionally believed that men can do”. This quote is indication of rural energy technology training specific outcomes that challenge gender stereotypes of what women see themselves able to do (for instance, Dutta, 2019; University of Oslo et al., 2019). Saumya (52, ML) commented, “I am pretty much independent, I don't feel oppressed”. This quote shows certain autonomy and freedom from subjugation. When I asked about their empowerment a teacher commented, “I can do anything and I can learn anything” (Shwati, 35, DL). These findings show how the respondents’ perception of themselves has changed. Perhaps, they show a shift from rural women’s internalisation as people of less value within their family and community (e.g. Kabeer, 2002) to becoming empowered.

Some participants’ accounts suggest changes in their purchasing power and mobility. For instance, Sunita (40. DL), an engineer, said, “I can make my own choices and decide what to wear” as achievements of her empowerment process. Noor (43, separated), another SE said, “I can buy what I want and go where I want”. A SCE commented, “I can buy beauty products, jewels and bangles for myself; I don't have to ask for permission to my husband” (Rashmi, 45, lives on campus). These quotes highlight participants’ increased purchasing power not only to satisfy the family needs, but also for fulfil personal wishes, thereby they seem to complement other studies that discuss how frequently women purchase items for the wellbeing of the family with their

revenue (e.g. Chant, 2016). They also show increased mobility as outcomes of the interviewees' empowerment.

My analysis suggests that in contrast with development literature that, as mentioned before, tends to depicts women as victims and oppressed, the participants commented that their engagement in the solar programme has been 'transformative' of their perception of what it is possible to do (e.g. (Mohanty et al., 1991). In particular, they referred to their increased autonomy and independence, and their awareness about different scenarios to their oppression. A few of the respondents had the lifetime opportunity to travel abroad and to represent the organisation at official meetings and conferences to show the work of the College in other countries. They became role models for other women in India and internationally. From the analysis, it also emerges that the training affected participants differently. They suggest a level of greater 'transformative' empowerment and the achievement of broader strategic gender interests for the SCEs and STs, than the SEs due to their engagement with the NGO.

The SCEs are able to satisfy not only their material needs (being these practical, for their survival, or productive, for income generation), but also their strategic interests including challenging their status and position in the society; this independently from their status and age. My analysis suggests the ability for some women to make choices that before were denied to them, such as, for instance, travelling in India and abroad. I argue that the long-term engagement of the STs and the SCEs with the NGO, and the campus as a place for enabling transformation, made a difference in women's ability to participate in decision-making and in their freedom of choice, therefore contributing to transforming their daily lives. Hence, I suggest that the temporal and spatial features presented by the eco-village model offered a 'space for manoeuvre' not only in its intellectual and psychological aspect, but also as a physical space where to grow personally and professionally as discussed in the Introduction. In regards to the SEs, the findings of six out of 12 interviewees who

replied, show that strategic changes happened for them as well, such as deciding upon their job, challenging their mindset, and being able to compete in the rural energy job market with, possibly, the same or more expertise than men.

6.3.2 Changes in the Solar Mamas' lives after the training

In this section, I discuss the changes that happened in women's lives as outcomes of the participation in the SMs programme. These themes are embedded in my framework, and I suggest that they do not specifically relate to energy technology education and practice, but more so to the training experience and the engagement with the NGO. Some intersect, as shown in Fig. 22.

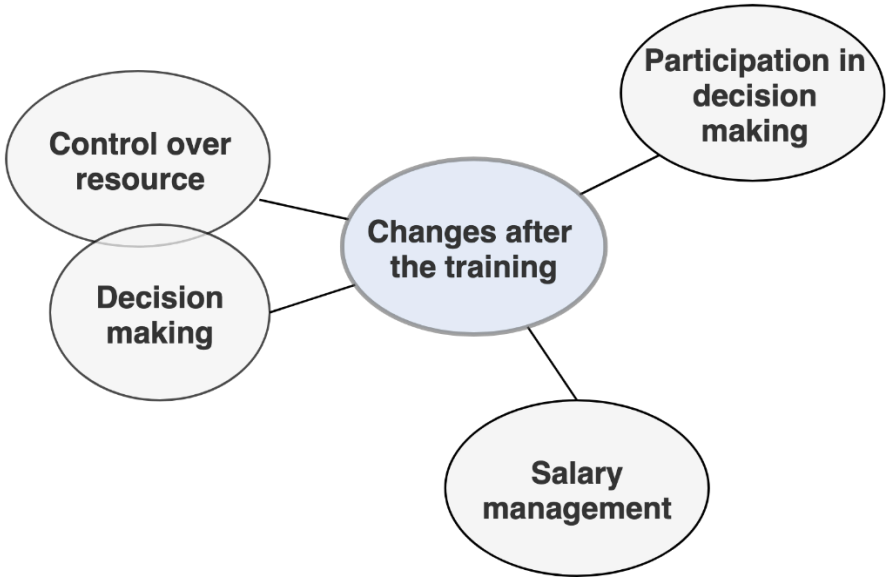

Fig. 22 Changes after the training

Control over resources and decision making

These themes intersect with my framework, and they are interrelated in that they require the participants' engagement in controlling resources or deciding about issues within the household. My analysis shows that the engagement in the training partially contributed to women's 'transformative' empowerment in decision making. In particular, it shows that attending the training is not enough to generate such changes,

and that perhaps awareness raising of gender inequalities at household level could support further ‘transformation’.

In conversation with the interviewees, six of them (a SE 27, DL; a SCE, 35, DL; and four STs 30, no IL; 50, ML; 50, lives on campus; and 40, ML) said that they decide together with their husbands. For six (a NT, 37, no IL; two STs, 35, DL; 30, lives on campus; and two SEs, 20-40 DL, and 30, DL), the family takes decisions. For two, a ST (52, ML) and a SE (52, ML) there have been no changes they take their own decisions. The latter, added that decision about resources at home are taken together with her husband. Two engineers (20-40, DL, and 30, DL) commented that they do not even have a say. A SE, in particular said:

> [t]he decisions are taken by my mother-in-law mainly. I am not consulted neither I give opinions. My husband is also involved in the decision making but not myself. My husband consults me but not my in-laws. I feel that I should be consulted (Sameena, 20-40, DL).

However, she also commented that:

> I feel that the situation has changed though after the training since my family consults me more often. They believe that now I know more so I can be consulted. In addition, they know that they can rely on my work when farming doesn't go well, and they can take care of the children (Sameena).

This quote highlights how the knowledge acquired by the engineer and being an asset for the family, in terms of being able to contribute to the household’s budget, ‘transformed’ her family’s perception of the participant, and her status of DL. This quote is evidence that rural women are, at times, subjugated not only by patriarchal

norms, but also by constraints dictated by their status and position within the household (e.g. as a daughter-in law). An engineer (27, DL) said that she could take decisions concerning her child. Similarly, also a NT (23, DL) decides on issues related to her child. Another commented, “my husband mostly decides; however he asks for my opinion. I am free to buy things (food, etc.)” (Aditi, 37, no IL). While other family members mainly take decisions regarding the household’s management, a couple mentioned that they have a say or that they can decide upon the clothes to buy. As I explored in previous chapters often women take part in decisions concerning their children and the satisfaction of basic needs of the family, including food (e.g. Kabeer, 1999b). However, as Kabeer (2017) suggests, questions arise on whether these kinds of decisions challenge gender responsibilities within the household.

It seems that there are not many changes for the solar engineers, since their families are mostly in control. Perhaps, once back in their villages and families, the participants face old habits and customs that see them as subordinated. Having lost their network, they are unable, alone, to challenge these kinds of constraints. As discussed in Chapter 3 for some women the intervention of the College played an important role in supporting the negotiation process by engaging with the family and building trust with the community. As Batliwala (2015) suggests, a key role of women’s organisations is that of bridging interests in place and foster equality.

The management of the Solar Mamas’ salary

In this section, I explore who, within the household, is responsible for the salary earned by the Solar Mamas, and how this is used. Managing the salary can satisfy the participants’ needs and interests, whether they are practical, productive or strategic. My findings show discrepancies among the participants. While most SCEs and STs manage the salary alone or with their husbands, most of the SEs give it to their in-laws. The findings highlight how living on campus contributes to broader

‘transformative’ empowerment for the participants. Managing finances contributes to women’s human and economic empowerment.

When interviewing the 32 participants, 13 of them said that use their earnings together with their husbands’, of which four are engineers (52, ML; 38 no IL; 40, DL; and 35, DL). Two commented that their husbands also share their salary with them (30, no IL and 40, ML), other three interviewees said that both salaries are used for the family needs (40, DL; 30, no IL; and 50, lives on campus). Ten participants are responsible for it, of which four are widows; three engineers (27, DL; 20-40, DL; and 30, DL), three STs (35, DL; 30, lives on campus; and 27 lives on campus) and one NT (23, DL) give it to their in-laws. An engineer, in particular commented, “they [the in-laws] only give me a token of my salary” (Sameena, 20-40, DL). This evidence, confirms other studies that highlight how local customs in rural India, where people usually live in extended families, often see the male heads of the household in charge of the finances (Kantor, 2003). I suggest that in similar contexts raising all household members’ awareness of gender inequalities could, perhaps, generate long-term change in women’s life.

In relation to how the salary is used, four teachers (of eight) (35, DL; 30, lives on campus; 50, lives on campus; and 27, lives on campus), three SCEs (of six) (35, DL, lives on campus; 28, lives on campus; and 45, lives on campus), and six engineers (of 13) (52, ML; 38, no IL; 40, DL; 35, DL; 30, DL; and widow) spend their salary for the family, and for the household management including food. A few of the engineers spent it for personal items; in particular, three engineers (35, Dl; 30, DL; and 30, DL) and a NT (55, ML) had some jewellery made. Noor (43, separated), for instance, said, “I bought some land and I had a house built on it”. Kavya (40, DL), another engineer, commented, “I built the shelter for the goats”; Saumya (52, ML) said, “I bought a mobile and radio with my salary”. Similarly, Pooja (25, DL) bought a new dress. However, she also added that she was a victim of violence and coercion as her husband forced her

to repay his debts since he was unemployed and used to drink. In Kabeer's view, practices of domination of women happen in the public and private sphere (2002; Raj et al., 2018). They can include forms of violence by the husband or other family members, discrimination in regards to the access to resources, including food, the predilection of sons, and so on (ibid.). This interviewee's claim is an example of women's vulnerability to the pressure that their relatives put on to them due to cultural traditions and beliefs and their reluctance to change, as also Sharp et al. (2003) report often happening. It seems that women in poor families, as Kabeer (1999a), and Kantor (2003) indicate, are more likely to spend their salary on basic items such as food or for their children. Seventeen (one NT, six SEs and two STs) interviewees invest their salary for their children; nine (one NT, four SCEs and four STs) mentioned specifically their children's education, as I discuss further in section 6.4.1.5.

My analysis shows that some women reached a greater level of empowerment than others did in terms of being able to manage their own salary within their family since they are somehow either in control of it or they jointly manage it with other family members. It seems that, the participation in the training alone is not enough to generate change regarding the management of the salary for all the participants. Maybe a long-term strategy with the engagement of the whole family could be more beneficial for challenging local customs and generate change because, as Clancy et al. (2012) claim, given unequal power relations within the household, intrahousehold negotiations mostly favour men. This happens also in relation to resources management (including the household's income and women's salary) and their distribution (ibid). The findings unveil both women's 'effective' and 'transformative' empowerment in relation to the income management for the Solar Mamas; while some satisfied basic priorities, others have been able to take decisions more independently and fulfil personal wishes. It is often difficult to gauge whether women's choices are actually their real ones or if they sacrifice them due to their prescribed gender roles

and responsibilities as mothers and wives (some women, for instance, might have wanted to purchase personal items such as jewellery or dresses but felt unable to).

Participation in social networks

As explored in previous chapters, in Rajasthan, many women find themselves marginalised within their domestic domain; this curtails their participation in the public arena and their socialisation outside the household (Kabeer and Huq, 2010). The theory of women's empowerment in development suggests that engagement in the public sphere and networking are essential aspects of the empowerment process to share experience and, possibly, initiate collective action (e.g. Kabeer, 2002; Batliwala, 2015). This theme is tied in with my framework, and I have selected it because my findings echo some studies that highlight a tendency of discriminating against women in the political arena in India (e.g. Adhikari et al., 2004; Torri, 2010; Batliwala, S., 2015). Further to this, my findings also show discrepancies among participants according to their role, accentuating that those women engaged with the College in different remits achieved a greater level of participation than others did.

Three women (55, ML; 27, lives on campus; and 28, lives on campus) commented that prior to joining the training they felt isolated and lonely at home. One teacher, for example, said, "I was feeling very lonely at home, so I thought that by working I could have felt better" (Shikha, 27, lives on campus). Five interviewees (52, ML; 40, DL; 30, DL; 50, lives on campus, 40, ML) expressed that among the benefits of having participated in the training there were meeting new people, and in particular, being exposed to different experiences. Four SCEs (35, DL; 28, lives on campus; 45, lives on campus; and 38, lives on campus) and two SCWs (no info, no IL; and 50, no info), three STs (52, ML; 35, DL; and 50, lives on campus) and two SEs (52, no IL, and 40, DL) engaged in informal women's groups or in community *Panchayati Raj*. A teacher lamented that she mistrusted local politicians since they were not usually

interested in listening to local villagers needs after the elections. In particular, she said:

> I don't go to the *Panchayat* meetings since my house in the village was damaged and the local representatives said they were going to fix it. However, they never did (Shahana, 50, ML).

In the same vein, a NT commented:

> I don't attend these meetings because all the people that have power have meetings in their houses. There is never an open meeting that happens in the villages (Aditi, 37, no IL).

Another said, "[…] in *Rajput* communities they [community members] don't allow women to participate in those meetings and to move around" (Prestha, 55, ML).[95] Similarly, an engineer said, "[t]he *Panchayati* meetings include only men and a few teachers from the pre-school are invited as well. I think that everyone should be invited to go" (Krisha, 27, DL). As I discuss in Chapter 5, interviewees engaged in the focus group made similar comments. Two main considerations emerge from the participants' accounts. It appears a level of mistrust and aversion towards the local political system, which further discriminates against vulnerable groups. It also seems that, although willing to take part in the local politics, there is strong bias against women, and local norms and beliefs prevent them from being included in public fora. For instance, although there is a quota of seats allocated to women as political representatives at local level, local customs reserve these roles to men (Adhikari et al., 2004; Torri, 2010; Batliwala, S., 2015). This is evidence of asymmetric power relations that operate not

[95] The word *Rajput* derives from *raja*, or "monarch" and *Putra*, meaning "son". A Rajput is a member of the northern India's Hindu warrior caste that is considered as one of the upper castes in Rajasthan (EB, 2019).

only at household level, but also within communities, and the broader society.[96] An interviewee (30, no IL) attended local *mahila melas*, while three (35, DL; 50, lives on campus; and 38, lives on campus) were part of informal groups or participated in activities organised by the College also including political rallies for women's rights.[97]

One SE (40, widow, DL) said that once back home there was a lack of engagement in the village. The SEs go back to different villages, therefore they lose the contacts made at the College, as previously explored. Perhaps further support from the partner organisations could allow them to identify existing women's groups or to create new ones. Feminist literature on development has recognised the importance for rural women to expand their social network beyond the family where women are constrained by gender inequality and subordination (Kabeer and Huq, 2010). Meeting other women at the village level can facilitate sharing their struggles, support each other and gain the knowledge and tools to generate collective action (ibid.). Rahman and Rao (2004) point out that in rural villages of North India, women are forced to leave their house and move with their husband's family, sometimes to other villages. Women enter the new family in a position of subordination, not only in regards to their husband and other male members, but also to their mother-in-law (ibid.). Being away from home, these women lose their social network, relationships, and role within their community (Kabeer and Huq, 2010).

Again, it appears that the experiences from respondents living on campus, or

[96] To my knowledge, the organisation is not involved with the local *Panchayat*; however, as these findings show, some teachers, solar cooker engineers and engineers do seldomly participate in local politics. Those women participating in the SMs' programme, are therefore free to chose whether or not to engage in local politics. As discussed in section 5.5.4 the BC runs a women's empowerment programme that involves women on campus and local women in organising and participating in political rallies and other campaigns on women's rights. Through this programme, the organisation raises women's awareness of women's rights, social and gender equality issues, therefore contributing to wider women's empowerment. Women engaged with the College are free to participate in these activities, as my findings show. Perhaps, the BC engagement with the local *Panchayat* would have ensured greater participation of the SMs in it, and therefore women's broader political empowerment. However, my case study focuses on the SMs' programme solely and not on the BC broader activities.

[97] *Mahila melas* are festivals or fairs for women.

in the nearby villages, are different from those of the SEs who left after the training. On campus, although not always participating in formal groups, there is a sense of solidarity and support. The respondents commented that their lives are intertwined, that they check on each other, comfort and motivate themselves. By sharing similar experiences, they built strong relationships and a community. A teacher, for example, commented:

> [on campus] informally women check on each other's health if someone is unwell. In this way we [women living on site] get to know about each other's problems and together deal with them (Divya, 30, no IL).

Their engagement with the NGO changed women's lives, some women added; therefore, they are keen on getting other women involved. Women's collective agency translates, on campus, as building relationships, solidarity, and community feeling. These are relevant aspects "to processes of women's empowerment", as Kabeer and Huq suggest, and contribute to their human and social empowerment and development (2010:79; Kabeer, 2003).

6.4 Learning new skills, enhanced employability and entrepreneurship

6.4.1 The Solar Mamas' training

In this section, I discuss the findings related to the training as a learning experience for the participants to explore whether and how informal education has contributed to their empowerment (as discussed in Chapter 3). Rural energy technology training allows women to learn specific related skills, including assembling, repairing and maintaining solar PV systems, building solar lamps, and getting to know about electric circuits. These skills are usually the competence of men; hence, their acquisition challenges the gender division of labour and contributes to gender equality.

Additionally, energy technology training is also a catalyst for the acquisition of further skills other than those gained as solar engineers. There is evidence that the training model based on informal knowledge sharing, best suits the needs of rural women. Additionally, there is indication that the exposure to the international solar programme broadens women's horizons, as I discussed in the Introduction. The engagement in the SMs' programme also produced intragenerational and intergenerational outcomes, such as increased education, which affected not only the participants but also second generations (daughters and sons). In section 6.4.3, I discuss the findings related to the SCEs and SCWs' training because it is different. Fig. 23 shows the themes that I discuss in the following sections.

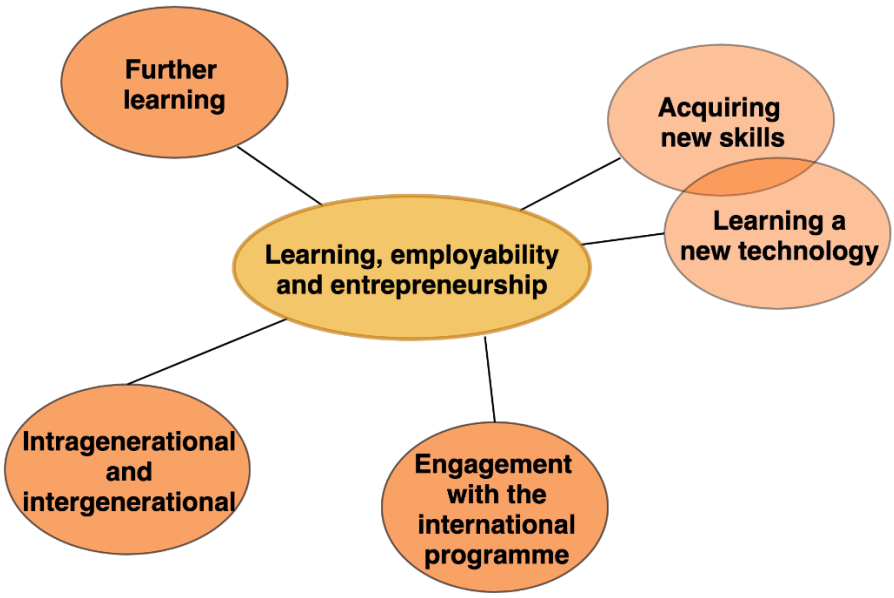

Fig. 23 Learning, employability and entrepreneurship

6.4.1.1 The training as a catalyst for further learning

This theme is embedded in my framework of analysis, and echoes other studies that highlight how participating in energy technology training equips women with specific technology-related skills (e.g. Ulsurd, 2015; Winther et al., 2017). My analysis provide particular insights linked to the participants' experience of the training because it provides them with specific expertise that challenge gender stereotypes and

knowledge domains. It also highlights that attending the training prompted the participants' willingness to learn more. Therefore, the training contributes to greater 'transformative' empowerment because participants questioned their knowledge and expertise and are keen to engage in further training. However, my findings also show differences among respondents groups highlighting how those who engage further with the College achieve greater 'transformative' empowerment.

My analysis suggests that the teachers were mainly interested about technical or content changes to the programme, and they were seeking for advancement in training in order to become more specialised or to increase their knowledge. The engineers, instead, were concerned with their economic stability after the training, and are willing to acquire more expertise in income generation activities to satisfy their 'productive' needs. There is an issue with the durability of the changes, which requires further support by the NGOs. When talking to the participants, it became evident that of the 13 engineers, two (38, no IL, and 40, DL) would like training in ICT and two (35, DL, and no info, widow) further training in engineering. Nine expressed an interest for training in tailoring, working with beads, embroidery or eventually anything proposed by the NGO; only one (30, DL) said that if she had access to light at home, she would like to study. In particular, six of the SEs are interested in working from home or close by. One NT (55, ML) also commented that she would like to engage in other training offered by the NGO.

On the one hand, as Clancy et al. (2004) suggest, organisations should accommodate women's needs in terms of location and time of the training in order to facilitate their engagement. However, on the other hand, it is questionable whether training in activities such as tailoring and embroidery to generate a revenue, which reinforce the gender division of labour, would challenge gender roles and responsibilities. These findings also reiterate that many women face barriers in relation to their mobility especially if the training venue is far away from their villages; lack of

transport, the geography of the territory, and patriarchal customs might hinder their participation in training.

In regards to the STs, three of eight (30, lives on campus; 40, ML; and 27, lives on campus) of them would like further training on solar engineering; three (30, lives on campus; 50, lives on campus; and 27, lives on campus) would like to advance eir linguistic/literacy competences; and other three (30, no IL; 35, DL; and 40, ML) are not interested in further training. A teacher, for instance, commented:

> […] young people say, why are you teaching women, why don't you teach us? If they want to learn, they have to go to a city and pay. So, I feel that now I have the skills, I have learnt it, and this is something that will stay with me all my life (Jaya, 52, ML).

This quote shows the teacher's satisfaction about the training since it provides particpants with the skills and confidence to compete in the rural energy job market, they acquired expertise that men and young people would like to have. This puts them in a position of advantage compared to men, and challenges the gender stereotypes of the domains of knowledge and of roles within the households that I discussed in Chapter 2.

Another teacher, for instance said:

> [t]here is no reason to be hesitant about how good the training is and the teachers. What the College does is great, women also receive a salary to study; other institutions ask for fees (Shwati, 35, DL).

Participants receive a compensation while training, which is unusual. This quote

highlight how training is expensive for those living in situations of extreme poverty; it becomes elitist, reinforcing the subordination of vulnerable groups. Perhaps, specialised training, such as on solar energy technology, appears to be scarce in rural areas, encouraging youth migration to cities. Under-employment and out-migration are phenomena that create a 'loop' in development since they emphasise rural communities' dependency on urban areas (Barefoot College, 2015e). Thus, the College is offering options for the long-term self-sustainability of rural communities (ibid.).

6.4.1.2 Acquiring new skills

This theme is tied in with in my framework; the findings resonate with previous studies that suggest that rural women encounter specific constraints when engaging in energy technology training because of their low literacy level, mobility and time (Dutta, 2019; University of Oslo et al., 2019). The findings suggest that, through its Solar Mamas' programme, the Barefoot College is challenging the assumption that men usually run energy projects and take decision making positions because they are knowledgeable. GED scholars have also criticised this tendency (Cecelski, 1995; Mathee and de Wet, 2001; Annecke, 2003 cited in, Cecelski, 2004). During the training participants acquire rural energy technology related skills and some added ones, including basic literacy and numeracy, which are critical for the participants' human and social empowerment, and contribute to wider gender and social equality.

In conversation with the SMs, they voiced having learnt about electric wiring, circuits and connecting batteries. For instance, a ST said, "I learnt about the circuits of the solar lamp, how to cut the wires and install them, and how to use the toolkit" (Roma, 40, ML). Similarly, another teacher commented:

> I learnt about the resistance, circuits, wiring, how to assemble a solar lamp.

> The solar panels are ordered from somewhere else, so we [the SMs] don't learn how to build them but how to connect them (Divya, 30 no IL).

An engineer also said: "I learnt about the Power Control Panel (PCP), about the circuits and soldering" (Noor, 43, separated). This is evidence that respondents learnt rural energy technology specific expertise and knowledge. In addition, the interviewees spoke about having acquired new skills other than on solar engineering. For instance, they learnt basic literacy such as names of tools, objects, colours, and numeracy. As I discuss in the next section, having met women from different countries, some participants felt the need to learn English. Additionally, participants in the solar cooker's programme learnt many other concepts and skills that enabled them to subvert pre-existing cultural and structural constraints on their empowerment, as I discuss in section 6.2.3. For example, Jaya (52, ML), a teacher, said, "I feel skilful; I can run a class now". Shahana (50, ML), another teacher, commented, "I was illiterate and I wasn't able to add or multiply big numbers, I didn't know the name of the colours". Diya (30, DL), an engineer, said, "[a]part from the circuits, I learnt to write my name, communication skills and social etiquette".

The 'Barefoot Model' of training is grounded on peer-to-peer teaching (Barefoot College, 2012). In line with the philosophy of the college, the SMs have the opportunity to learn, unlearn and relearn based on their own knowledge and experience. I witnessed the classes while in Rajasthan and the didactic of the course focuses on the 'learning by doing' method and observation, women can then better memorise the basic steps to assemble, operate and maintain solar panels and to build solar lanterns. As the founder of the organisation emphasises, education is not about literacy, but it is about the knowledge and experience that people accrue in their daily lives (as discussed in Chapter 3) (ibid.).

6.4.1.3 Learning a new technology

This theme is intersected with the 'acquiring new skills' theme, my framework of analysis and to the discussion in section 6.4.2.[98] It resonates with Clancy's view according to which, although women might have less confidence to start with when approaching a new technology, with the right method and training, they will be able to learn "enthusiastically and successfully" (2003:14). Further to this, my findings highlight the importance of training in energy technology in rural contexts, such as in Rajasthan where many women and girls find themselves subjugated within the domestic realm and excluded from education and skills transfer programmes. The findings show specific outcomes related to the acquisition of energy technology skills, such as challenging prescribed gender knowledge domains and equipping rural women with the knowledge to compete in the rural energy technology job market.

During the fieldwork and further by analysing the data, I was able to understand the innovative approach that the College is adopting. Their aim is to simplifying technological knowledge to equip rural illiterate and semi-literate women with the specific energy technology skills required by the rural energy job market, such as building and distribution of solar lamps, cooling and freezing, food processing, and milling. The data shows discrepancies among the participants, while some women felt challenged by the topic of the training, other felt at ease. Most of the interviewees (14 women who shared their view in this regard), articulated their fear when they first started the training. The initial two weeks, they added, were the most difficult. Some of these women have never been to school before; therefore, they were reluctant and hesitant to join in. A teacher said:

> [a]t the beginning I was scared; I had no idea how to match the colours of

[98] Although intersecting with 'acquiring new skills' and 'learning a new technology', I discuss the outcomes related solar cooker training in section 6.4.2 because the SCE received different training.

> the cables and I thought that I was never going to make it (Divya, 30, no IL).

Another commented that prior to joining the training she was not able to multiply or add big numbers and did not know the names of the colours. At the beginning she doubted how to do the work, and what she could do; however, whenever she was struggling she kept saying to herself:

> I came here to learn, so I should learn this. I came here with this intention. I have an opportunity that many women do not have. Women come over from abroad to a place that they do not know; if they can do it, I can do it as well. I should make myself strong (Shahana, 50, ML).

An engineer (30, DL) commented that she was not educated and she used to cry in the middle of the session. However, the teachers at SARA motivated her a lot to continue. Other women from India and from abroad see women at the college as role models. The impact that the experience of the solar programme generates is not only beneficial at local level, but also at a global level since the training has scaled up internationally in several countries of the global south.

The technology input of the NGO has gone beyond how to operate the panels, to include the use of tablets for teaching and learning. Therefore, the College has digitalised all the training material. The idea supporting this technology shift is that, "we [the College] believe that especially the poorest and most marginalised…must be digitally capable and aware and unafraid to engage with digital tools", as the Project Lead, Barefoot College Solar Digital Night School stated (Barefoot College, 2017). Although this comment was addressed to children, it can be assumed that this is true also in regards to other groups engaged with technology at the College, such as the SMs, in order to enable them to respond to the demands of the current rural energy

employment market. On this point, a teacher stressed that now they use tablets to teach. While this is ensuring rural women's technology uptake in order to enable them with the skills demanded by the rural energy employment market, she also added "[i]t is sometimes more difficult to understand although the content is then displayed through a TV" (Binita, 50, lives on campus). She found it challenging because perhaps, this is the first time in her life that she has used these kinds of tools.

Nevertheless, other participants voiced their enthusiasm and curiosity about learning a new technology, four interviewees felt at ease, and other four were excited to learn. One of the NTs commented:

> I am not scared of it and I am very enthusiastic about it; I am positive that I would successfully finish the training and then work as an engineer (Prestha, 55, ML).

This was one of the oldest interviewees, a rural woman over 60 years old, widow and illiterate. Diya (30, DL), an engineer, for instance, said, "I feel very good about being a solar engineer. I feel that I can be an entrepreneur now". This quote highlights how learning about energy technology specifically encourages women's entrepreneurship. Another interviewee said that when she started teaching other people she felt amazingly good. These findings echo Clancy's (2003) suggestion that it is the role of organisations "both to meet [women's] specific needs and to bridge their technical knowledge gaps". Moreover, NGOs need to create a safe space "in which the women [are] not afraid to make mistakes or to ask questions" (Wides, 1998 cited in Skutsch, 1998). As several women observed, and as discussed in previous sections, the College is doing this by offering an environment in which there is less social pressure, which offers different stimuli, and which enables the participants to start their empowerment process. The exposure to learning about energy technology innovation

for rural illiterate women (without differences dictated by their age and/or status) also challenges gender stereotypes and social inequalities, and encourages greater participation of vulnerable groups. Low level of literacy and the lack of technical skills are among the reasons why development projects and programmes often exclude women from technology transfer, and constrain them in the domestic arena. In the case of mechanisation of the activities, men are again often considered better suited for the job; this frequently happens in rural Rajasthan (Meadows et al., 2003; Singh and Kumud, 2013).

6.4.1.4 Engagement with the international programme

This theme emerged during the interviews; it is connected to the concept of solidarity discussed in my framework, and contributes new insights to women's empowerment and GED literature. While GED scholar claim that as an outcome of women's participation in development programmes, they often build solidarity, my findings show that in addition to solidarity, the exchange and exposure among local participants and those engaged in the international programme, has widened their horizons and contributed to broader 'transformative' empowerment (e.g. Clancy et al., 2004).

In conversation with the participants, it became evident that the exposure to the international context persuaded women to learn English, Hindi and basic literacy. For example, a teacher said, "I am learning English and Hindi; I have knowledge now" (Divya). Similarly, another teacher also commented, "I'm learning English at home by myself to be able to talk with foreigners and the international mamas" (Nidhi). At the College, the teachers who deal with the international programme have the possibility to attend English classes, which are also open to all staff. The STs and the SCEs also have the opportunity to interact, on a daily basis, with volunteers, visitors, and other women from all over the global south. Some women described this as an incredible

experience that exposes them to different realities and broadens their horizons. The approach adopted by the College is new, and is contributing to challenging rural women's perception of their condition and status, therefore contributing to their 'transformative' empowerment. For instance, one of the SCEs said, "I have got a lot more confidence; I learnt how to speak in Hindi and some English. This is a total exposure for me" (Chandni). Similarly, a teacher commented:

> illiterate foreign women participating in the training inspired me and I wanted to learn about it as well. If they are learning, why can't I learn! With this ambition I came here, I learned, I am interested in this field, and I want to continue this theme. I like to be with foreigners (Shwati).

My analysis suggests that that the programme has been 'transformative' for the teachers, and for the SCEs in that, it has triggered their interest in developing other areas of their lives, such as for instance by improving their literacy and technical skills to become more knowledgeable as solar engineers. This contributed to achieving their strategic gender needs and interests. However, it is also evident that there are limitations of the programme in regards to the engineers who are seeking to satisfy their productive gender interests. Lack of continuity of employment due perhaps to shortage of funds from partner organisations, transport and mobility issues for those women who have to work in different locations than their villages, or, in some cases, scepticism shown by communities who are strangers to the SEs are among the constraints that they face once the training is finished. This issue raises questions about the sustainability, in terms of their durability, of these kinds of development interventions.

6.4.1.5 Intragenerational and intergenerational outcomes

This theme is tied in with my framework and resonate with previous studies that show the link between rural women's empowerment and access to energy brings intragenerational and intergenerational outcomes concerning their education and that of their children (e.g Kabeer, 1999b; Winther et al., 2017). In particular, my findings show that for 13 participants their daughter's education was of special importance for them. This shows a shift and the willingness to challenge girls' marginalisation and gender responsibilities within the household. These considerations are particularly relevant in the context of high female illiteracy, such as in Rajasthan (Jangir and Azeez, 2017).

When talking to the participants, five interviewees recognised that education is important for girls and women. Women's participation in the training (as an opportunity for exchange and for widening their views) and access to electricity at home increased the opportunity for their children to read at home and to attend school. Again, this is an indication that access to energy and energy technology training acted as catalyst for the achievement of broader goals and skills, as I discuss below. The engagement in the training raised women's consciousness about the importance of educating girls to enable changing their condition and position in society. As explored in Chapter 5, for instance one of the teachers said that the solar lamps were "used by children attending the night schools" (Divya, 30 no IL). One NT (37, no IL), four STs (30, lives on campus; 50, ML; 50, lives on campus; and 40, ML) and five SEs (38, no IL; 40, DL; 40, DL; 35, DL; and 30 DL) recognised their children's attendance at school as essential. In particular, two NTs (37, no IL, and 55, ML), three STs (30, lives on campus' 40, ML; and 27, lives on campus) and six SEs (27, DL; 52, ML; 38, no IL; 40, DL; 40, DL; and 43, separated) referred, in addition, to the importance of sending their daughters to school. A teacher, for example, commented, "I am not educated but I would definitely like that both my children would get educated since it could help them

later in life" (Shikha, 27, lives on campus). Another teacher also said:

> My son goes to a private school therefore most of my salary is spent for his education. When my daughter will have to go to school, I will send her also to a private school. I want also my daughter to get a good education (Nidhi, 30, lives on campus).

Similarly, another added:

> I have two daughters. I teach them in the evening and I always tell them that I went to night school but they have to study and learn more and do more (Shwati, 35, DL).

In addition, another teacher pointed out the benefits of accessing light at home:

> [a]ccess to lighting at home is beneficial mainly for education. The number of girls that go to school has now grown up drastically. Girls also enrol in the Rajasthan police and defence; therefore, in order to get these kinds of job, the families are focusing on making sure that the girls study. They [the families] don't want to use the light too much for other things; they want to make sure that there is light for the children to study. All the girls here are enrolled in school. After they finish work in the fields in the day, in the evening women have time to do stuff. Before women were buying fabric and send it to the tailor. Now that they have light, they can do it themselves. Additionally, they are able to save money and do whatever they like (Jaya, 52, ML).

An engineer (40, DL) said that she thinks education is important for girls and women, and that they should work. Another commented, “I would like my daughters to get married, but I sent all of them to school since I think education is important” (Megnaa, 38, no IL). A NT also added:

> [m]y daughter studied a bit, but my granddaughter goes to school. I think that it is important nowadays for girls to study since it would be easier to get married. The first thing people ask when arranging a marriage is the level of education of the girls (Prestha, 55, ML).

The last quote points out how currently, education is a prerequisite to getting married, even in rural areas. In her study in Bangladesh, Kabeer finds that there is a shift among poor families; these, are now willing to invest in their daughters’ education since this will enable them:

> to marry more educated, and hence better-behaved husbands, that less dowry would be asked of an educated bride, that husbands would respect a working woman; that it was no longer acceptable for women to be uneducated (2001:78).

Nevertheless, it is questionable the extent to which this challenges gender stereotypes and social norms. My analysis shows that these are examples of a level of strategic thinking and planning of the respondents to satisfy their strategic interests and to ensure better living conditions and the education of their daughters. Therefore, these women purposefully contribute to the ‘transformative’ empowerment of their children and daughters’ in particular.

Five of six SCEs and one SCW felt that children’s education and, in particular,

their daughters' is important. All the daughters are attending or went to school. One of them became a teacher. This shows how the engagement in the Solar Mamas' programme raised women's awareness in recognising education as a priority for the personal and professional development of their children and their daughters' in particular. Therefore, they are challenging rural customs and traditions that see women marginalised in the domestic realm. My analysis highlights that also for the SCEs and workers there is indication of their 'transformative' empowerment and the achievement of their strategic gender needs. There is evidence of a process of questioning and reflection by the women on their position and condition in society and of their strategic thinking about further improvements for the immediate and future well-being of themselves and their family.

6.4.2 The Solar Cooker training

This section is connected to 'learning a new technology' theme; however, I discuss it separately because through the training, the SCEs acquired a specific set of skills compared to the other participants in the solar programme. In this and the following sections, I will discuss the themes in Fig. 24, which are tied in with my framework.

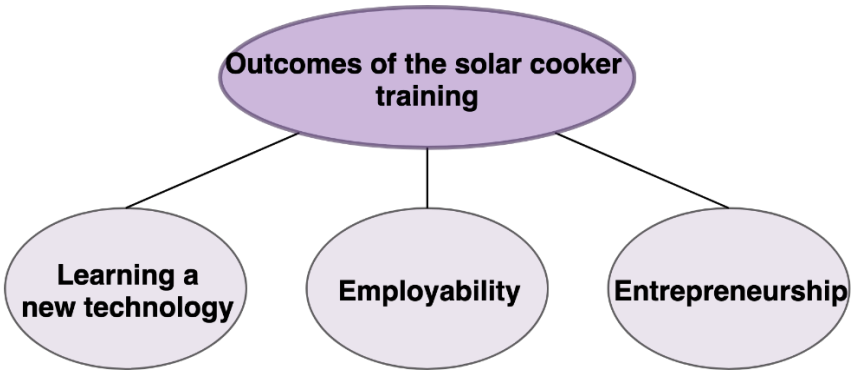

Fig. 24 Outcomes of the solar cooker training

The SCEs needed to gain particular skills related to the building and the

functioning of the parabolic solar cookers. These are specific energy technology related skills that are not usually considered to be in the knowledge domain of rural women. Their acquisition challenges the stereotypical gender division of roles and responsibilities, and shows that energy technology training can be a catalyst for rural women's participation in the rural energy job market, and to promote gender equality. In addition to these skills, they have also acquired competence in geographic concepts such as the latitude and location, in mathematics and metrics.[99] These findings are particularly relevant to contribute to gender equality considering rural women's low level of literacy, technical expertise and confidence to embrace training and revenue opportunities in the energy technology sector (University of Oslo et al., 2019).

In conversation with an engineer, Chandni (38, lives on campus), I learned how challenging it has been for her the solar cooker training because she was illiterate, she said. Gangi (35, lives on campus), commented that has been difficult to learn about metrics, latitude and longitude, and to understand how the solar clock worked. She showed me drawings she made with chalk on the floor together with the other engineers that indicated the measures and the steps they had to follow in order to build the cookers. She said:

> [w]e [the engineers] are not educated so we had problems with the calculations and the mathematics. However, people form the College motivated us to understand that women could learn and do anything; this is not a job for men only! (Gangi).

Four of six of the SCEs felt that the training was beneficial to them to become versatile, acquiring new skills, and learning about energy technology. They are aware and want other people to realise that: "women are not limited to the kitchen only", Aparna (no

[99] See Chapter 4, section 4.2.5.1.

info), a SCE, added. In the discussion on their perception of empowerment, women came to recognise that they could perform all the tasks that men do, that their life and way of thinking has changed. The participants' awareness about their condition and position in society has broadened and they challenged some constraints dictated by the social customs. An interviewee, in particular, said:

> [t]his is totally a new experience for me. For fifteen years, I have only been at home looking after my children. Muslim women are not allowed outside their houses. Since I started working, I felt good. I don't need to ask my husband for money (Chandni, (38, lives on campus).

My analysis shows how the engagement in the training, not only contributed to achieving material gains and to satisfy productive gender needs (e.g. an income), but how women's perceptions of their condition and position in society, and of different scenarios to their marginalisation has positively changed; therefore contributing to greater empowerment.

6.4.2.1 The Society of the Women Barefoot Solar Cooker Engineers

The engagement with the NGO has been 'transformative' for some of the participants in that, after the training a group of engineers set up the first Women Barefoot Solar Cooker Engineers Society (WBSCES) in 2006. This section is connected to several themes, including 'learning a new technology' 'employability' and 'entrepreneurship' themes. I learnt about the WBSCES during my fieldwork in conversation with the SCEs. The experience of the SCEs and their entrepreneurial drive are new insights in GED and women's empowerment literature because the WBSCES is the first set up by rural women in India. In the same way as other studies suggest, in order to managing the society, the SCEs learnt about sales, accountancy,

purchasing, business management, and contributed to the design of the cookers (Dutta, 2019).

When talking to the participants, it became evident that, among the reasons behind the creation of the society, there were: gaining employment skills and generating income, the interviewees' willingness to entice otherwise marginalised village women, showing that although they are not educated they can do different kinds of work, including what is considered men's work, and increase their self-reliance and self-confidence. For instance, a SCE commented:

> [I wanted to m]otivate and empower other women. I know that I can be an example to other women. I moved through villages to inspire other women, motivate them and talk about solar energy" (Gangi, 35, lives on campus).

Similarly, another engineer said:

> [the idea was] to give women more work and employability skills. Women from the villages are not exposed and they are not allowed to move out. We [the engineers] wanted to make them more confident and self-sustainable, so we felt the need to make this society (Chandni, 38, lives on campus).

This quote refers to the concept of self-reliance in order to ensure women's independence and to 'expose' them to alternatives to their marginalisation. In addition, their wellbeing and happiness has improved. Chandni also said:

> women from the village got exposure and they finally got out of their houses since before they weren't allowed to so. They got an income, a job and felt more self-reliant. Since both husband and wife work in these communities,

they are able to fulfil their basic needs.

Those women who trained and use the cookers at work had the opportunity to get new skills, to meet likeminded women, and to increase their income. Their involvement in the programme also increased women's mobility, as four participants commented. Sonali (28, lives on campus), for instance, added, "I visited other Indian states for the installation of the clean energy cookers". As the engineers suggested, this increased their self-esteem and confidence. Although women are usually only allowed to do housework, Chandni (38, lives on campus) added that at the College "there is no caste and sexual discrimination; even women can do any task". The egalitarian environment that characterises the College allowed these women to challenge the gender division of labour and responsibilities dictated by local traditions and customs; therefore, contributing to the improvement of their self-esteem, their emotional wellbeing and to greater gender equality.

The SCEs participated in the design of the cookers together with the engineer who designed the parabolic cookers, by tailoring the solar cookers according to women's needs and ensuring better functionality. An engineer, for example, said:

> […] following the original design, it was difficult for women to cook, so we [the engineers] had to lower the stove so that the light could be better reflected. We also added a pipe for the fumes, therefore, making the cooker more efficient. I am satisfied of having participated in improving the cookers (Rashmi, 45, lives on campus).[100]

Performing managerial and engineering tasks did not come without challenges: out of the eleven women who started the first training only three remained, perhaps

[100] A German engineer, who collaborated with the College, designed the parabolic cookers.

due to the difficulty of engaging with complex concepts (math, latitude, and so on) and tasks. As the engineers commented, some of them felt overwhelmed when they first started. A SCE said, “[a]t the beginning it was very challenging since I am illiterate” (Chandni, 38, lives on campus); similarly, Gangi (35, lives on campus) commented, “I had to learn welding and bending to make the solar cooker, although I am not educated”. However, a SCE (no info) and a SCW (no info, no IL) pointed out that they became multi-skilled and able to handle a multitude of tasks; in particular, Aparna, a SCE added, “I can do all the tasks that men also do”. Additionally, another engineer said, “I am learning new things every day” (Chandra, 42, lives on campus).

My analysis suggests that these quotes show how the engagement in energy technology training has promoted women’s ‘transformative’ empowerment by providing them with specific energy technology skills to compete in the rural energy job market, and, therefore contributing towards achieving gender equality. However, the scale of job offers in rural Rajasthan in this sector are not clear. The quotes also show how the engagement in the society presents several challenges for rural women that break socio cultural constraints and that encourages their collective agency. Through the training and the engagement in the solar programme participants benefitted in different ways, including promoting entrepreneurship. As discussed in the Introduction key outcomes of the solar energy training programme are practicing what women learnt, and acquisition of skills for employment and entrepreneurship. This enabled women also to gain better control of their lives, as Batliwala and Reddy claim this to be one of the challenges of energy development programmes (2003).

At first, after setting up the society, the engineers had to challenge, in more than one occasion, social customs that reinforce gender prescribed roles and responsibilities. For instance, these norms in rural Rajasthan consider women approaching local traders as unacceptable; the traders initially refused to deal with them. Although one SCE (35, lives on campus) was already working as solar engineer

at the College and three (42, 28 and 45, live on campus) others had their husbands working at the Barefoot or for partner organisations, three (35, 42, 38, live on campus) faced opposition from their community since they challenged the caste system. In order to assemble the cookers, they learnt how to weld; a specific low caste in India usually carries out this activity. An engineer, for instance, said, “people of the village were commenting that welding and working with iron is done by a lower caste” (Chandra, 42, live on campus). In the same vein, another engineer discussed her experience with the training at the beginning:

> [t]o build solar cookers we [the engineers] had to do lot of work, and it meant welding and working with iron. There is a specific low caste in India that does this work, and I am a woman, so why do I have to do it? Other women were concerned about this as well (Gangi, 35, DL).

Their communities strongly disagreed with them due to the caste system that determines roles and status; this is evidence of how the caste system curtails women’s empowerment, and how, often, rural women do not have the means to challenge social constrains alone. These quotes also show different outcomes of being a solar engineer in the private and public sphere. Thus, these women have shown strong determination and willingness to change social customs.

Another SCE commented:

> [s]ince I am from a Muslim community, initially my community didn't like the idea of me working with men. However, I managed to convince them that at the College there are other women working with men and they are equal (Chandni, 38, lives on campus).

The engineer emphasised that on campus there is an egalitarian modus vivendi that celebrates cooperation among people living and working there. In some rural areas of India, local restrictions can be deeply entrenched in the society, and, therefore difficult to eradicate (Batra and Reio, 2016). Nevertheless, these findings suggest that a safe living and working environment is key to facilitate the transition from rural housewives to energy entrepreneurs. The support from the NGO and the campus as a 'space for manoeuvre', enabled women's agency to transform their situation by navigating social constraints on their empowerment. After the training and after setting up the society, the SCEs did not encounter particular challenges about generating a revenue because they receive a regular salary from the College. They are in a position of advantage compared to the solar engineers interviewed since the College better supported them by developing a sustainable strategy when dealing with the orders of the solar cookers from schools, crèches and other public offices, and, therefore, ensuring an ongoing income for the SCEs, as previously discussed.

6.4.3 Women's entrepreneurship

It has been telling to explore the level of women's agency after the training in terms of their willingness to pursue other income-generation activities; this supported understanding how transformative the programme has been for women in this sphere. 'Entrepreneurship' is a theme embedded in my framework of analysis. There are reported cases of high underemployment rates in rural areas of Rajasthan, and people's engagement in agricultural activities for their survival (for instance, GOI, 2006; Jha et al., 2015; Saha, 2019). My findings show that due to issues of poverty and vulnerability of rural communities, some women sought other employment opportunities to cope with their situation.

For example, one of the engineers, said, "I am from a very poor family and I felt that I needed to do something to improve my situation. I wasn't keeping well also"

(Madhu, no info, widow, DL). Of the STs, two (30, no IL, and 52, ML) sought other opportunities. One, in particular, was involved with a partner organisation, and she also did some independent electrical engineering work, she commented:

> I would like to learn new skills for financial support that I could use not only as a solar engineer, but also electric engineer for any kinds or repairing in other places (Jaya).

Of all the interviewees, only one teacher does an activity that relates to energy, and which is extra to her role as solar teacher. I suppose that the lack of further training in electric engineering, as a few women lamented is missing, impinges their ability to progress as engineers and find additional employment. Time and financial constraints might affect the possibility for the NGO to offer complementary training. The same teacher does also some embroidery and stitching at home while another (30, lives on campus) would like to get involved in something else if there was the opportunity.

Seven (20-40 DL; 40, DL; 43, separated; 30, DL; 30, DL; 52, ML; and no info, widow) of 13 engineers engaged in other income-generation activities, independently from their age and status. Noor (43, separated), for instance said: “I work part-time as an engineer three days a week, and the other days I work as a cook for a partner organisation”. Saumya (52, ML), commented, “I worked as a solar engineer for six months only. I am working as a labourer for the Government’s NREGA programme”. [101] The first trained solar engineer (no info, widow, DL), in particular, became a coordinator of a rural centre. When I asked about her empowerment she added, “[w]omen also have to do any kinds of activities and to move ahead in life”. Two work

[101] This is an anti-poverty and employment generation scheme launched by the Indian Government under the National Rural Employment Guarantee (NREGA) or Mahatma Gandhi National Rural Employment Guarantee (MGNREGA) Act of 2005, which ensures at least 100 days of minimum wage employment in rural areas (Goi, 2005).

in family farms or in animal husbandry, while another does embroidery and stitching.

As previously commented, none of the SCEs and workers does any other activity because having the salary and employment stability they do not feel the need to search for other opportunities. Notwithstanding the economic stability, the engagement with the training encouraged their entrepreneurship and this promoted further empowerment; dealing with the women's society they created, the SCEs are already quite busy. While it is evident that, the lack of continuity of income forces some of the SEs interviewed to engage in other activities, the findings show a degree of entrepreneurship among these women that are seeking further personal and professional development.

My analysis suggests that while earning a salary contributes to women's economic empowerment, it is not clear whether it challenges prescribed gender structures that discriminate against women. As Kabeer (1999a) claims, resources, agency and achievements are indivisible; therefore, only with the triangulation of the findings, is it possible to understand the extent to which achievement in one area of women's lives has also positively influenced other areas in terms of their empowerment. Hence, I suggest that only an analysis at individual level can disclose whether their economic empowerment affected other aspects of the participants' lives to generate broader 'transformative' empowerment as my findings disclose. My analysis also shows that participating in the SMs' training has been a catalyst for some women's entrepreneurship, to seek employment, and enabling them to venture in to new revenue generation activities and respond to theirs and their families' interests and needs.

6.5 Summary

Clancy et al. (2004; 2012) claim that training in energy technology can support the empowerment process of rural women; however, there is evidence that in the rural

Rajasthani context there are instances of structural discrimination against women due to poverty and patriarchal customs, such as the *purdha* and the caste system, which require additional elements to facilitate women's 'transformative' empowerment (e.g. Bidner and Eswaran, 2015). There is evidence of womne's awareness of their status of structural subordination. For some of them, this influenced their participation in the SMs; programme. Living on campus and being a ML, for some, meant more independency and autonomy than before, the realisation of their capacity and the possibility of making their wishes come true. I suggest that the cooperative model of the Barefoot College complements the training on energy technology by offering not only a 'space' for consciousness raising, but also a non-hierarchical, democratic and egalitarian modus vivendi; a physical space where women can pursue their empowerment. The novelty of community living on campus is that it fosters not only sustainable living, but also promotes gender equality and social justice within pre-existing structural opportunities and constraints. While the role of NGOs in development is debated, the analysis of the findings reveals that the Barefoot College acts as enabler and facilitator of change in a socio-cultural and political context of strong marginalisation against rural women, such as that of Rajasthan in comparison to other states in India (Agarwal, 1997a, Mitra, 2014).

The engagement in the training together with the life on campus, and the exchange with the international women promoted the satisfaction of practical and productive gender interests while encouraging women's strategic thinking to generate transformative change. Clancy et al. (2012), point out that it is difficult to prove the causality between energy access and the changes that occur in women's and men's lives, since studies show that the availability and access to electricity per se are not enough to create or start up enterprises (for example, Cecelski, 2005; Karlsson, 2007; Kooijman-van Dijk, 2009). Therefore, it can be said that, energy technology education, and the involvement with the NGO life are key additional elements to facilitating the

empowerment process for rural marginalised women.

Access to these kinds of programmes, while supporting women's 'effective' agency in terms of their "efficiency in carrying out their given role and responsibilities", can also contribute to their "transformative" agency (Kabeer 2003:174). The latter happens when women start to think more strategically, questioning and challenging their position and condition in the society (ibid). The vision of women as victims is demystified in favour of a portrayal of the solar engineers as change agents and entrepreneurs. Sharing common struggles and the exposure to different scenarios encourages a sense of solidarity and collective action for the participants. There is evidence of the temporality of empowerment as a process that can affect also future generations. Children, including girls, have access to light and their education is encouraged, while their mother's vision and roles are shifting from the traditional ones. Questions arise about the durability of changes for those engineers who leave the campus after the training. Perhaps, complementary services offered by local organisations can support the engineers to navigate customs permeated in the Rajasthani rural culture to ensure greater and long-lasting transformation. Women's transformative empowerment is evident in regard to the SCEs who, although were illiterate when they joined the program, gained many skills, and faced context specific challenges that were curtailing their empowerment, including the purdah and the caste system. Their experience contests prescribed gender roles and responsibilities, while also contributing to closing the gender employment gap. The engineers acquired leadership and entrepreneurial skills that boosted their confidence to act collectively to entice other women. They become role models within their communities, and support challenging other women's marginalisation.

Chapter 7. Lessons from the Solar Mamas' programme: empowering women through living and training together

7.0 Introduction

My thesis provides empirical insights into the extent to which, and how, the Solar Mamas' programme of the Barefoot College facilitates the empowerment of women in the specific socio-cultural setting of rural Rajasthan. The overarching research question arose from a critical review of literature on gender, energy and development (GED) and women's empowerment in development, and from the study of NGOs' practice on the ground in dealing with energy, women's empowerment and development, with a specific focus on India. A critical thread that emerged from Chapters 1 and 2 surrounds how access to energy, and to training on energy technology for women living in off-grid areas, can support their 'effective' and 'transformative' empowerment, as conceptualised by Kabeer (2003). Another critical debate, concerns the role of NGOs in facilitating the empowerment of rural women in the context of India that I discussed in Chapter 3.

My case study suggests that energy access and energy training programmes such as the Solar Mamas (SMs), can support achieving a particular kind of empowerment. I argue that although empowerment cannot be given to others (e.g. Mosedle, 2003) the intervention of the BC is critical to and offers unique features facilitating the participant's empowerment. The combination of an innovative training model with the life on campus and the exposure to the SMs' international programme, which are new approaches to community integration and gender equality, has promoted greater 'transformative' empowerment for those women who lived and/or worked on campus compared to those who left after the six-month training. These are new models of community integration and knowledge sharing in gender and energy field, which not only focus on community living, but also encourage 'transformative'

change in women's lives by promoting gender and social equality and challenging their position and condition in society.

Some feminist scholars working on women's empowerment in development claim that empowerment entails 'transformation' in women's lives in terms of challenging social and institutional constraints on their subordination (e.g. Kabeer, 2003; Batliwala, 2015; Cornwal, 2016). However, they also recognise that empowerment is a process, and that, therefore, it can take time for substantial changes in women's lives to happen. The spatial and temporal dimensions of empowerment are important for women engaged with the College, and highlight how empowerment is an ongoing process. My findings show that 'transformative' change has also had intergenerational impacts by positively affecting the daughters and sons of the women engaged in the programme, since they have been able to influence decisions concerning them (e.g. school attendance). Engagement with the NGO also promoted women's entrepreneurial skills in the rural energy technology field, therefore challenging prescribed gendered knowledge domains and division of labour. These processes are critical to achieving global goals that call for greater gender and social equality, and justice.

7.1 Discussion of main findings from the case study

Having presented the findings of my case study research in Chapters 5 and 6, my aim in this chapter is to elaborate and reflect on the main findings highlighting the significance of my thesis in relation to its contribution to the fields of women's empowerment in development, and gender, energy and development. I have organised the discussion into three sections (below) that intersect with the three main insights that emerged from my analysis, and which I introduced in Chapter 1. Using feminist methods of data collection and analysis, coupled with a feminist constructivist epistemological approach, have allowed for the discovery of in-depth insights in

regards to women's energy practices and needs. They also supported revealing the constraints women face in their daily lives due to social inequality. The qualitative feminist approach to the research has proven to be critical for raising issues regarding the practice of energy technology knowledge transfer, the implementation of the solar programme, and how this affected their lives in terms of their empowerment process. These unraveled from women's accounts. This research approach also allowed ongoing reflection on the meaning and implications of the findings in the context of rural Rajasthan.

7.1.1 The eco-campus and intergenerational empowerment

The first insight that emerged from my analysis is that:

i) the NGO innovative eco-village cooperative living model offers spatial and temporal features to facilitate long-lasting changes in resident women's lives. There are also instances of transformative empowerment affecting the interviewees' daughters and sons, therefore encouraging their transformative agency.

7.1.1.1 The eco-campus

In countries of the global south co-operative models have historically developed for participatory development and to acquire appropriate technology (Litfin, 2014). The need to overcome social alienation, the ecological crisis, and to promote technological innovation drove the creation of movements seeking self-sufficiency (ibid.).[102] I suggest that the Barefoot College campus can be defined as an ecovillage in that it strives to shape sustainable and participatory modus vivendi. The campus shares commonalities with other ecovillages models such as that it has been built by local communities using

[102] Examples of those include Gandhian, alternative education, environmental and feminist movements (Litfin, 2014).

local materials, partially relies on solar energy (the old campus is also connected to the grid), and uses rain water harvesting and water purification systems. In addition to 'ecological' features, it also "confront[s] ideological differences from a dominant culture" (Ergas, 2010:35). As Ergas claims:

> individuals within one ecovillage actively create a collective identity through a process that includes generating a collective vision by agreeing on common values, establishing goals, and converting them into action (2010:33).

Similarly, in Dawson's view "ecovillages also tend to see themselves serving a wider cause, strengthening community, nurturing the local economy, and engaging in educational or demonstration activities" (2006:52).

The eco-village model offered by the campus plays a pivotal role in enabling conscientisation of those women living on site and/or are engaged with the solar programme. This lead to some women's broader 'transformative' empowerment, as theorised by Kabeer (2003), by enabling them to question and challenge constraints on their empowerment. This approach is a novelty in GED and women's empowerment in development literature. Some feminist scholars working on women's empowerment in development, referred to the concept of 'space for manoeuvre' abstractly, as to indicate a psychological or cognitive aspect for instance, for consciousness-raising, or in terms of increasing bargaining power (e.g. Cornwall and Edwards, 2010; Cornwall, 2016). Similarly, Wides (1998) and Skutch (1998) talk about home training as a 'safe' environment for raising women's awareness. In addition to these insights, I suggest that the campus offers specific features that facilitate the participants' empowerment: it is a safe and egalitarian place where women can build self-confidence and solidarity to challenge the dominant patriarchal society. The locality plays a critical role, together

with the temporality, in the empowerment as an ongoing process. Therefore, the solar programme is not only offering technical expertise, but also the place, and the time, for those involved to shape their empowerment. The campus, and the engagement of women in the campus life, represents a physical 'space' where women can nurture their empowerment. The participants emphasised that the egalitarian non-hierarchical environment (without biases determined by, for instance, gender, religion, caste, age, and status) and approach to community living, represents a microcosm where principles of social justice and equality are celebrated and respected. Community living models can prompt sustainable living by, for instance, fostering onsite resource production and saving, and social inclusion. However, in addition to these elements, the campus life fosters greater transformation, by challenging gender and social inequality in a context shaped by poverty, social discrimination, patriarchal norms and customs that constrain the empowerment of women. Women are actively engaged in the community life, participate in decision making, the community's awareness of women's capabilities is challenged, and they developed a sense of solidarity by engaging in collective efforts to overcome the constraints on their empowerment.

7.1.1.2 Intergenerational empowerment

The findings enable further understanding of what elements support achieving greater 'transformative' empowerment since they show how the intersection of the dual aspects of locality and temporality (intragenerational and also intergenerational) appears to be significant in the empowerment process of the Solar Mamas. They highlight the intergenerational (temporal) aspect of empowerment that, being a process, can affect not only those who started it, but also future generations. Transformation may take a generation or more, and the findings underline how empowerment is a process that happens over time as an outcome of continuous negotiation. They show that challenging social constraints and norms can be difficult;

these require questioning and acting upon changing deeply rooted customs. Nevertheless, while perhaps there are not many changes in the short-term, greater outcomes can be achieved in future, or for future generations.[103] Thus, this is evidence of specific outcomes related to access to light and training in energy technology that can be promoters of wider change. I argue that the temporal dimension of empowerment as an ongoing process plays a pivotal role in generating change along with the spatial dimension mentioned earlier. These insights confirm previous studies in women's empowerment in development and GED literature that show how combining energy access and women's empowerment can positively affect the education standards of their children, and their daughters especially (e.g Kabeer, 1999b; Winther et al., 2017). Baruah (2015), for instance, discusses evidence of intergenerational benefits of lighting for children's education in India. Further to this, my analysis brings to focus the relevance of challenging gendered roles and responsibilities that see girls marginalised within the domestic sphere in the socio-cultural context of Rajasthan with the highest level of female illiteracy in India (Jangir and Azeez, 2017). Improving girls' literacy levels can also positively affect other spheres of their lives, such as health, nutrition and employment. Understanding these processes is needed when conceiving development interventions, policy making and planning that seek to contribute to global goals on equality, justice and sustainable development.

There is evidence that the engagement in the solar programme and learning about energy technology produced different outcomes for the participants according to their roles. There is indication of a more 'transformative' empowerment, in terms of challenging social constraints and developing strategies for the personal and professional development, for the solar teachers and the solar cooker engineers

[103] This kind of evaluation is difficult without longitudinal data collection that I have not been able to do as explained in Chapter 4 and that I recommend for future research in Chapter 8.

compared to the solar engineers. The absence of a 'space for manoeuvre' for the latter has hindered their empowerment process. Nevertheless, working as engineers ensured more financial independence than before and willingness to embrace further training and working opportunities, therefore contributing to their economic empowerment. Their involvement in the programme has also contributed to challenge participants' marginalisation and, to some extents, their subordination. For instance, the engineers are seen as role models within their communities, therefore positively influencing their self-esteem and confidence (for example, some women felt recognition from their families and communities). Nevertheless, it is difficult to gauge the extent to which the engineers' strategic interests and needs have been met. On the one hand there is evidence of a level of intergenerational impact (on children's, and, in particular, on daughters' education); however, on the other hand, it is not clear whether the solar engineers reached a level of transformation in their lives in terms of their ability to challenge social structures. It is worth to mention that the engineers' role is not to be seen in an instrumental way, as to satisfy their community's energy needs solely. Additionally, perhaps, these are not always the same as the engineers' needs. The engineers' engagement as role models enables greater equity and equality and stresses women's agency to generate change within their community. Although taking part in the solar programme has widened their perspectives and contributed to questioning their status, position and condition within their household and more broadly, my analysis suggests that the loss of cooperative networks constrained their collective agency to generate greater change inside and outside the family. This is perhaps because they did not have the means to act alone. Constraints on further development and change are represented by the temporary nature of the intervention, and by the intersectionality of poverty, marginalisation of rural women, gender, caste, status, religious and patriarchal customs, which are particularly ingrained in the Rajasthani culture.

7.1.2 Exchange and solidarity

The second insight that emerged from my analysis of the case study is that:

ii) together with the Indian solar programme, the BC trains rural women from over 80 countries in the global south. The interchange between local and international women who face similar challenges related to their subordination and social inequality, creates solidarity and exposes them to different scenarios. Thus, it raises their awareness and promotes greater change.

The interplay between transient and resident women's groups emerged as a new insight from my analysis. The exposure of the local women to women from other states in India and to foreign women, to visitors and volunteers, together with the exchange of experiences, promoted cohesion and opened their vision of alternative scenarios allowing appreciation for commonalities and differences. Clancy et al., (2004) discuss that often, as an outcome of informal training programmes on energy, those taking part in them develop solidarity. My findings show that the exposure and exchange of the Solar Mamas' experiences, contribute specific insights that affect women's solidarity and inspire collective action to challenge constraints on their 'transformative' empowerment.

The process of sharing personal and cumulative experience created special ties among the local and the international women. Some participants became aware of sharing commonalities with the international women related not only to their gender, but also to their marginalisation, poverty, and subordination at different levels depending on the socio-cultural context in which the international women live. This awareness enabled broadening their views, strengthening their relationships and fostered 'transformative' change. As found in women's empowerment literature, these processes are fundamental for women's empowerment because they contrast the

victimisation of women, and treat them as agents of 'transformative' change. For instance, some interviewees stated that they enticed other women from nearby villages to fight their marginalisation and subjugation within the domestic realm. This is an example of women's strategic thinking and 'transformative' agency, or the 'power with' to generate change; networks of collective action can bring long-lasting transformation, as Kabeer (2001) and Batliwala (2015) claim.

The exchange with the international women pushed some local participants to learn English and Hindi, and encouraged some of them to travel in India and internationally; these are new insights in GED literature. For instance, as some interviewees commented, this has been one of their most significant experiences in terms of their empowerment. This is evidence that the involvement with the Barefoot College further contributed to the empowerment of the solar teachers and solar cooker engineers because they fought their isolation and marginalisation. The exchange prompted women's curiosity and creativity contributing to their psychological and intellectual development. As I discussed in Chapter 2, Kabeer (2001) claims that these elements are critical for human empowerment.[104]

Together these factors -- living on site, the engagement with the NGO for those who live nearby, and the exchange among local women, the international women and the wider NGO community -- converging in time and space, contribute to broader global goals by promoting the sustainable social and economic development of the interviewees. These are internationally claimed to be essential for achieving greater social justice and equality (Sen, A., 1999; Escobar, 2011; Pandey et al., 2012; IEA et al., 2018).

[104] As discussed in Chapter 2, Kabeer (2001) recognises human resources as contributing to their human empowerment.

7.1.3 Beyond rural energy technology training

The third insight is that:

iii) the training and the engagement with the NGO encourages women's entrepreneurship in the rural energy technology sector, increasing their self-esteem and autonomy, and equipping them with the skills to compete in the rural energy technology job market. This, in turn, challenges the gendered division of labour and knowledge domains, and contributes to greater gender equality.

7.1.3.1 Popular education on energy technology

Agarwal writes about what she learnt from the interaction with rural women in India; she claims that, "for poor women's empowerment, what is needed is less the raising of consciousness and more the strengthening of their ability to overtly protest and mobilise for change" (1994a:254). While Agarwal's point is relevant to achieving greater empowerment, such as by challenging institutional structures, I suggest that there are different levels of engagement for marginalised women depending on the socio-political context in which they live. Due to multiple context-specific socially constructed constraints, women living in remote areas of Rajasthan might not be able to self-start their empowerment process.

My research contributes to uncovering these socio-cultural and political context-specific constraints that can disrupt rural women's empowerment, of which their gender is one aspect (intersecting with caste, status, religion, and *purdah*). In these circumstances, consciousness-raising could be an essential starting point that can lead to generating greater change. Perhaps those women who live constrained within their domestic realm are not aware of different scenarios to that of their marginalisation and they do not feel able to act legitimately against it. Thus, introducing measures such as consciousness-raising and advocacy can transform social and gender relations and to

challenge the sexual division of labour. Consciousness-raising and advocacy might be suitable for supporting, shaping and achieving strategic gender interests and needs (March et al., 1999).

The novelty of the 'Barefoot Model' in relation to both the training and the cooperative living approach lies in the intersection between tradition and innovation. The NGO's philosophy celebrates grassroots knowledge and peer-to-peer learning, and combines it with new energy technology knowledge transfer adapted to the learning pace and to the needs of illiterate communities (Barefoot College, 2012). The College does not provide certificates for the engineers at the end of the training; this new approach contrasts socially constructed expectations and requirements that further marginalise vulnerable groups that, living in poverty, cannot afford to enroll in training. This model, as commented in Chapter 6, also encourages rural communities' self-sustainability (Barefoot College, 2015e). Clancy et al. (2004; 2012), discuss that popular education is traditionally used as a practice in development interventions for women's awareness raising. They emphasise that it is critical for women's empowerment since it supports raising women's awareness of different scenarios other than their marginalisation, and provides them with skills and knowledge (ibid.). However, there is a lack of empirical evidence on women's empowerment through energy technology training in the context of rural Rajasthan. My thesis fills this gap by providing new insights from the analysis of my data. My analysis contributes to the debate on women's 'effective' and 'transformative' empowerment by bringing perceptions on the extent to which energy technology training can promote these and the achievement of practical, productive and strategic gender needs. The training equips participants with the expertise to respond to the needs of the rural energy job market, including solar lantern rentals, phone and battery recharging, hairdressing, food cooking and storage, therefore contributing to their 'transformative' empowerment. The training also contributes to women's acquisition of new skills

beyond those on energy technology, such as basic literacy and numeracy. This kind of intervention is very much required in areas with a high level of female illiteracy, such as rural Rajasthan (Jangir and Azeez, 2017).

Engagement in energy technology training specifically challenges the victimisation of women, their portrayal as beneficiaries of intervention and as users of energy services. These approaches by development interventions have been criticised by, for instance, Mohanty et al., (1991), as I discuss further later on. Women's agency as experts in energy technology knowledge and practice within their communities also contrast prescribed gendered division of labour and of the knowledge domain that discriminate against women. This shift is fundamental to establish greater equity and equality in participating in the RET job market. Energy technology knowledge is innovative, and employment in the rural energy technology market supports shifting women's status to a higher one. However, to foster wider gender and social equality there is the need to promote broader socially progressive policies that favour women's formal employment in the energy technology field and ensure economic stability. I recognise these as limitations of BC intervention, as I discuss further in Chapter 8.

7.1.3.2 NGOs as facilitators of women's empowerment

My thesis builds on and contributes to the work of Agarwal (1994a) when she contests some western feminists' definition of empowerment as a process that needs to be initiated by disempowered groups themselves (e.g. Batliwala, 2015). Although I agree that "empowerment cannot be bestowed by a third party", the context of rural Rajasthan is particularly challenging (Mosedale, 2003:2). For instance, although India has a progressive constitution, and the Rajasthani state government has policies and programmes in favour of gender equality and women's empowerment, it appears that there are discrepancies between policy and practice at a grassroots level. There is

evidence that the interplay of the national religious and political fundamentalism of the hindutva, together with the practice of the *purdah*, which, due to historical customs affects women from different religious groups, appear to be significant challenges to any concept of 'transformative' empowerment for rural women.

Although there is a dichotomy in development literature on the role of NGOs and whether these create dependency of the beneficiary groups, I argue that, under these circumstances, the facilitating role of the NGO is essential for rural women's consciousness raising and empowerment process (for instance, Kothari, 1987; Robinson, 1998 cited in Kilby, 2011; Nagar and Raju, 2003). In addition, the supporting role of the partner organisations of the College can be considered as critical in ensuring the sustainability, in terms of the social and economic durability, of women's empowerment. My thesis shows that the concept of dependency of vulnerable groups could be defied in cases of short-term development interventions, such as the Solar Mamas' training, considering the specificity of the socio-cultural context of Rajasthan as discussed above. Without the facilitating role of the NGO, those women who are marginalised would not be able to challenge socio-cultural and institutional constraints on their own and start their empowerment process. Six-months is perhaps not a sufficient time-frame for illiterate and semi-literate women who have never attended educational programmes, and that mainly live marginalised within their families first, and their in-laws' after, to build the leadership skills that enable challenging such constraints alone.

Although learning many skills and being exposed to the NGO life during the training, the SEs, compared to the STs and SCEs lose their networks with other women met at the College when they go back to their villages. This displacement disrupts their mutual exchange and collective action, which are essential to enable greater transformation; these are also exacerbated by the lack of mobility and communication tools (e.g. not all the SEs have access to a mobile phone). As mentioned above, the

supporting role of the partner organisations of the College is essential for the sustainability of the programme and for the engineers' engagement in it. As my study suggests, engagement with NGOs is an avenue for the empowerment process of those women living in conditions of marginalisation because they can offer a platform for reflection and action. Development interventions that operate in a socio-cultural context where women and girls face historical and contemporary intersectional constraints on their empowerment can be an enabler of social change.

The facilitating role of the NGO is essential not only to guarantee women's livelihoods, therefore focusing on a unidimensional aspect of empowerment (for instance, women's economic empowerment, as claimed by e.g., WB, 2014), but also to enhance their confidence and self esteem, to strengthen their skills, and elaborate with them a long-term agenda for their continuous personal and professional development, and that of their communities. Such strategies, if accompanied by networks and collective action, could generate greater change and challenge women's subordination at institutional, market and State levels, therefore addressing issues of social inequality and injustice, as also claimed by Batliwala (2015).

7.1.3.3 *Women's entrepreneurship in the rural energy technology market*

My findings show that the engagement in the solar cooker's training programme provides participants with competitive competences and knowledge. Having acquired specific expertise in the field of rural energy technology, and additional skills in fields of, for instance, sales, management, and geography, participants become leaders in this innovative sector that is developing in rural areas, and globally, and are in a position of privilege compared to other community members, including men. These factors are critical for the promotion of equal participation of women in the rural energy job market, also in consideration of the issue that this is a growing field (International

Labour Organisation, 2015). Estimations forecast the creation of additional 20 million jobs in this sector by 2030 (United Nations Environment Programme, 2011).

My analysis builds on previous studies that claim that, while women's competence in biomass energy for forestry management and cooking stoves is recognised, there is less empirical evidence on their influence in the non-biomass energy sector (for example, Cecelski, 2006). For instance, the Solar Mamas I studied gained skills that young generations of men would like to have, while also being offered a salary. This is evidence that the solar programme challenged the stereotypical gendered division of labour by training women to work as solar engineers. The analysis also highlights that the interviewees gained respect and recognition within their families and communities, therefore contributing to increase their self-esteem and confidence. However, although the energy technology training contributed to the employment of the participants, it is not clear the extent to which there are employment opportunities in the rural energy sector outside the remit of the College intervention. As I discuss further in the next chapter, the lack of secure and stable jobs for the solar engineers is a limitation of the development intervention that constrains their economic sustainability in the long term. The creation of formal and stable jobs for women in the renewable energy technology sector is a challenge in countries of the global south (UNEP, 2011; ILO, 2015).

The claim that 'transformative' empowerment has been achieved for some of the participants is further supported by the setting up of Women Barefoot Solar Cooker Engineers Society (WBSCES) by a group of solar cooker engineers. It is evidence of women's collective agency, and a positive example of rural women's entrepreneurship and leadership in energy technology. The society is the first association set up and run by illiterate and semi-literate women in India, therefore leading the way in the clean cooking stoves market, as Kakani (2014) reports. By analysing the work of the SCEs, I contribute specific and new insights to the GED and women's empowerment in

development literature. Living and working on campus, and being immersed in the NGO life, played an essential role in initiating and sustaining change in these women's lives. Again, the two elements of place and time offered by the engagement with the NGO facilitated the achievement of women's productive and strategic interests and needs. This, together with the stability of their salary also contributed to the social and economic development of the rural women engaged in the solar intervention, and to broader equity. The safety and security of the campus as a place in which women are exposed to different circumstances, and have the opportunity to reinvent themselves, enabled them to develop strategies for their future and that of their family. This is indication of how the engagement in the solar training and living on campus facilitated women's 'transformative' empowerment through entrepreneurship, and how their entrepreneurship promoted further change.

Importantly, the SCEs' role as managers of the WBSCES demystifies the portrayal of women as victims and beneficiaries of development interventions, and sees women as active agents of their empowerment. These development practices, as explored in Chapter 3, have been criticised because they tend to depict women as a homogeneous category (e.g. Sen, 1999). In contrast to this vision, the findings stress how people's capabilities and functionings are distinctive to each individual and are fundamental for their development. As entrepreneurs in the rural energy technology job market, the engineers who set up and run the society acquired many other entrepreneurial skills (e.g. managerial, accountancy, selling, and marketing) in addition to those as engineers. Their progress is shaped by the participants' struggles to challenge institutional and social constraints as they reported during my interviews with them. For instance, the interviewees chose to challenge the *purdah*; they have been confronted with male salespersons that, due to the gendered division of roles and responsibilities dictated by the dominant patriarchal society, refused any interaction with them. These findings highlight instances of women's collective agency to subvert

their subordination, therefore ‘transforming’ their condition and position in society.

Here the debate in feminist development literature on women’s perception of their legitimacy of what they are allowed or not to do is particularly relevant (Maher, 1987; Hughes, 1996; Kabeer and Huq, 2010). There is contestation over whether, due to their position and condition of subordination and to prescribed norms, rural women feel they are not legitimate to act, or whether their strategically choose ‘not to choose’.[105] The engineers are illiterate and semi-literate rural women; acquiring the competences as solar cooker engineers and entrepreneurial skills raised their awareness, and allowed them to challenge their internalised illegitimacy and devaluation within their family and society. I found that they gained self-respect, recognition, and that they learned how to deal with tasks usually reserved for men. In order to carry out some of their duties they also had to confront the prescribed rules dictated by the caste system, such as in relation to welding. Therefore, I suggest that the engineers’ ’transformative’ empowerment is evident in that they were confronted with and challenged multiple and intertwined socially constructed constraints determined not only by their gender, but also by their status, and by their position in relation to the caste system. Equipped with competitive skills, participants, not only became role models at the College, but also engaged in collective action to involve other women, therefore becoming leaders of change, and challenging women’s marginalisation within the domestic arena. These findings stress that with the appropriate training and confidence rural women can challenge structural, social and institutional inequality.

7.2 Summary

The findings discussed in this chapter support my conclusion, which answers my overarching research question, that energy access and training in rural energy

[105] I discussed this point in greater depth in Chapter 2.

technology can facilitate women's empowerment. In particular, the SMs' training and the engagement with the BC supported the achievement of a specific kind of empowerment for the women involved that is shaped by the distinctive features offered by the College. In my view, the importance of the campus as a 'space for manoeuvre' for the women engaged with them, that is not only safe, but also democratic, egalitarian and non-hierarchical is undeniable. This place encourages awareness raising and women's agency towards subverting their marginalisation and condition of subordination. The involvement with the BC has proven to have long lasting changes for those women who have been engaged with it, and indirectly for their children, emphasising that empowerment is not only a goal to achieve for development programmes, but also a process that develops over time. I argue that the two dimensions of the spatiality and generational nature of empowerment are important to facilitate 'transformation', and that the BC intervention has been critical to promote this process in the socio-cultural context of Rajasthan, shaped by strong discrimination against women and girls.

Although the campus is an example of a small-scale intervention, it would be interesting to explore its feasibility in other socio-cultural, economic, and political contexts, because it is a model operating in the right direction towards understanding constraints on rural women's empowerment, their coping strategies and mechanisms developed to challenge them. These kinds of models can translate into progressive and gender sensitive energy policies and programmes. However, I am also aware of constraints on the implementation of similar interventions due, for instance, to the cost and perhaps difficulties in enticing families to move to and embrace the specific features of communal living. My analysis suggests that empowerment happened at different levels among the participants' groups, and that those women who have been engaged with the NGO in different remits achieved a greater form of 'transformative' empowerment compared to those who left after the training. The involvement with the

BC supported increasing the bargaining and decision making power of the teachers and the solar cooker engineers. These outcomes have intragenerational and intergenerational consequences that also positively affect the interviewees' children (e.g. school attendance for boy and girls especially). The exchange of experiences with the wider BC community and the international women, and the exposure to different scenarios has broadened participants' horizons and promoted 'transformative' change. This is an outcome that has not been explored in the GED and women's empowerment in development literature. In addition, the engagement with the BC has facilitated instances of women's entrepreneurship in the rural energy job market with the setting up of the WBSCE society by a group of solar engineers, highlighting the important role of the BC in facilitating change and fostering broader gender and social equality.

While my assessment of the BC model is mostly positive, I have also identified several limitations of the SMs programme. The benefits of the programme are felt by women while living on campus but less so after the solar engineers leave the campus and return home after their training. The lack of stable employment options affects the economic sustainability of the engineers. The absence of social networks constrains their collective action to generate 'transformative' change. Additionally the engineers recognised the need to ensure energy services for communities' productive uses 'beyond the lightbulb' to contribute to development of rural communities. Addressing these limitations is critical for gender and social equality and justice, as I discuss in the next and final chapter.

Chapter 8. Conclusion

8.0 Introduction

Despite the existence of global development goals promoting energy access for all and gender equality (SDGs 5 and 7) the lack of progress towards social justice still disproportionately affects women. In India, although there are several governmental programmes promoting gender equality and women's empowerment, these have been ineffective at a grassroots level. This is why, in contexts such as in rural Rajasthan, non-governmental training programmes, as the Solar Mamas, are key to supporting women's human, social and economic development, and benefit households and communities at the same time. It is the conclusion of my research with the Barefoot College that energy access and training in energy technology are valuable not only for meeting practical needs but also for bringing about a process of social transformation.

In this final chapter, I reflect on the significance of this study in relation to existing knowledge regarding broader political debates on sustainability and energy transition in the face of climate change, global inequality and poverty. I discuss the contribution of my research to the academic fields of women's empowerment in development, and gender, energy and development in which it is situated. From these insights, I offer a set of recommendations to inform academics and professionals working at a grassroots level. I conclude the chapter by identifying questions for future research.

8.1 Contribution of the Solar Mamas' case study to women's empowerment through rural energy training

8.1.1 Global perspectives: energy transition, gender equality, and sustainability

Women's participation in the rural energy technology employment sector is often limited by the lack of social inclusion, skills transfer and financial support (Dutta,

2019). There is also a lack of empirical evidence and of gender disaggregated data related to women's participation in energy programmes and in the energy market (Clancy et al., 2004; 2012; Danielsen, 2012). Economic and technical solutions often result in top-down approaches, applied without consultation, that prove to inadequately respond to communities and vulnerable groups' needs at a grassroots level (Sörlin, 2012, Palsson et al., 2013, Prebble and Rojas, 2017). There is the need to question the global North-South dichotomy and local asymmetries that encourage and reinforce inequalities, and listen to the voice of marginalised and vulnerable groups in order to generate social change (Aguilar et al., 2004; 2007; Pearse, 2017).

It is not only about providing poor communities with electricity, but to ensure the existence of systems in place that guarantee equal access, economic opportunities and legal procedures that take into considerations structural constraints on rural women's development, empowerment, and participation in the energy technology training and employment sector. I suggest that, in order to formulate progressive gender-sensitive policies and development interventions, an analysis of the social fabric of households and communities should inform policy and programmes. There is evidence that, lacking resources and means, many women are also especially vulnerable in cases of emergency such as climate change related disasters due to the socio-economic and political issues they are faced with, including: poverty, malnutrition, and increased responsibilities within the domestic sphere (Aguilar et al., 2007; Pearse, 2017). In light of these kinds of events, the urgency to promote a global energy transition to clean energy services that contributes to environmental and social sustainability is also evident (ibid.).

Within this frame, my case study contributes insights into the understanding of how energy access and rural energy technology training by NGOs can facilitate women's 'effective' and 'transformative' empowerment within the context of rural Rajasthan. Additionally, my in-depth analysis of the SMs' programme of the BC offers

insights that are potentially applicable to similar development interventions operating in other contexts. The SMs' programme is an example of a small-scale development intervention that can generate change at local level; however, it is worth mentioning that the 'Barefoot Model' of training has scaled up internationally. Through implementation in other Indian States, and countries of the global south, it can create broader transformation as I discuss in section 8.3.[106] My case study shows that: there are gender differences in energy use and social differences in energy access dictated by gender and social roles and relations within the household that particularly affect women in different spheres of their lives. In a context of marginalisation, poverty and social discrimination against women and girls, the role of the BC has proven to be pivotal for the promotion of gender and social equality, and to facilitate the empowerment of rural women. Expertise transfer accompanied by the campus life style, the exposure and exchange with other women, leads to women's broader 'transformative' empowerment.

My findings show that access to clean energy supports the clean energy transition and the sustainable development of cummunities. It also positively contributes to people's health and wellbeing, to improve their living and working conditions, to the time management, income generation, safety and mobility. My thesis builds on other studies that claim that with the appropriate training and institutional support, women can become entrepreneurs in the energy sector, therefore challenging the gendered division of labour and knowledge (e.g. University of Cape Town et al., 2019). It brings new insights in the context of Rajasthan, by showing that rural women can, not only acquire skills, but also become empowered and contribute to their family and communities' sustainable development. This challenges patriarchal constraints and the portrayal of rural women as victims of social inequality and as passive beneficiaries of energy programmes (as, for instance, Clancy et al., 2002; 2012, are

[106] Currently, the BC has trained over 2200 rural women in 93 countries.

critical of).

My thesis brings to the foreground women's expertise as energy entrepreneurs, as designers, as outreach ambassadors, and as champions of change within their families and communities. If provided with resources and control over them, they can take part in decision making and become drivers of transformation. I suggest that although social, cultural, political, and geographical features shape how people live, energy need is universal. As such, ensuring access to energy, and tailoring training in energy technology to accommodate women's specific needs, can contribute to social equality and inclusion, to raise women's awareness of different scenarios other than their marginalisation, and to the sustainability of local communities. The acquisition of leadership skills, self-confidence and esteem, further contributes to women's empowerment process.

8.1.2 Contribution to the academic fields of GED and women's empowerment in development

Scholars working in the gender, energy and development field have debated the implications of access to energy services, and of training on energy technology for the empowerment of rural women in the global south. They have examined these implications in a range of places and contexts but I have not come across other research that is as centered on rural Rajasthan at this point in time. In this thesis, I have explored the connections of energy access and technology training with the empowerment process of rural illiterate and semi-literate women who engaged with the Barefoot College. Although some authors refer to the work of Barefoot College and its Solar Mamas' programme as examples of good practice, I have provided an in-depth and holistic picture of this development intervention through an exploration of its strengths and limitations (e.g. Oparaocha and Dutta, 2011; Mohideen, 2012; Practical Action, 2013, Winther et al., 2018).

In this thesis I have aimed at understanding and assessing whether and how access to energy (e.g. lighting) has brought 'power' to women to facilitate their energy practices, and whether their engagement in the SMs' training has encouraged their 'em-powerment' by challenging gender and social relations and other constraints (e.g. the caste system, the *purdah*, and religion). The conclusion that I have arrived at is that energy access can facilitate 'effective' women's empowerment and the achievement of their practical, productive and strategic gender needs and interests. Moreover, the eco-village model of the BC is a new approach, in the gender and energy field, that especially promotes the 'transformative' empowerment and social equality of those women living and working on campus. I build on Clancy et al.'s (2012) argument that although there is a correlation between energy access and empowerment, their causality is difficult to prove. My findings show that, while access to energy can support the achievement of practical, productive, and strategic interests and needs that have an immediate efficacy (e.g. street lights), it appears that additional elements to energy access per se are critical to achieve strategic interests that imply subverting power relations, and that, therefore, require long-term commitment and planning: the identification of the locality (the campus) as a microcosm shaped, not only by safety, but also by an egalitarian, democratic and non-hierarchical modus vivendi contributes to both GED and women's empowerment in development literature. Eco-village or residential community models perhaps, focus mainly on sustainable living, centred on saving resources and celebrating community interaction, as Gilman (1991) and Kirby (2004), cited in Ergas (2010) suggest. However, I argue that the life on campus additionally promotes gender and social equality by offering a physical and psychological 'space for manoeuvre', and by challenging the position and condition of women who might experience deprivation and inequality. This spatiality intersects with the temporality of empowerment as a slow process that is constantly negotiated over time, as asserted in women's empowerment literature. This is a new approach to

community living in the field of gender and energy, which promotes further social equality and justice, therefore contributing to greater ‘transformative’ empowerment.

The exposure and exchange of local women with international women emerged as an original approach adopted by the College and that especially promotes women’s ‘transformative’ empowerment. The engagement in the training and in the NGO life has promoted some women’s leadership and entrepreneurship. The WBSCES is the first organisation in India setup and run by illiterate and semi-literate women; this is a novelty in the context of India. My analysis suggests that the ‘transformative’ empowerment of the participants in the Solar Mamas’ programme transcends practical and productive features, such as technical skills transfer and having employment opportunities. By sharing knowledge and experiences on campus some women achieved not only economic empowerment but also broader psychological and social empowerment.

I contribute to GED and women’s empowerment in development literature by discussing new insights from the accounts of illiterate and semi-literate women that created and run the WBSCES. These women’s experience of their involvement in the training and in the campus life, suggest that the NGO role has been critical in fostering women’s entrepreneurship and leadership in the rural energy market. While rural women are often poorly represented in energy technology training and the job market, the engagement in the SMs’ programme has promoted a shift of their roles as energy managers, leaders of change within their communities and as entrepreneurs. Understanding these kinds of conditions and processes, as they are being mobilised by the BC model, is essential for the formulation of inclusive, global gender-sensitive energy policies and programmes.

8.2 Recommendations for practitioners

In this section, I discuss limitations and challenges of the SMs' programme and their implications for the practice of energy technology training at a grassroots level. Based on these insights, I elaborate recommendations for practitioners, such as professionals of NGOs or other institutions working at a grassroots level with vulnerable communities.

I suggest that a tailored participatory approach that is designed for and with each participant in rural energy technology training, could best facilitate greater 'transformative' empowerment by focusing on local needs and expertise. Decentralised training centres could support the engagement of those communities that live in conditions of strong marginalisation in order to ensure broader social equality and justice. Awareness raising of gender inequality at household level could promote wider gender equality and could challenge intergenerational customs that discriminate against women and girls. Development interventions should assess communities' energy needs to encourage their further development and wellbeing by, for instance, facilitating income generation activities. By identifying appropriate and affordable clean energy cooking stoves, it could be possible to address rural communities' nutritional and environmental issues related to the use of unsustainable energy sources. In order to encourage greater gender equality in rural energy technology training and employment of rural women, programmes should ensure the continuity of their employment and a fair salary.

8.2.1 A bespoke approach for women's empowerment

The epistemological approach that I adopted, supported uncovering multiple realities in relation to women's condition and position of subordination, which are shaped by women's individualities. This suggests that the development of tailored and personalised strategies for the future personal and professional development of

women in the rural energy technology job field could be an effective approach to achieving transformation. This approach takes into consideration women's personal and professional needs and interests, that of the people they care for, and their vision for their future. For instance, although feminist literature on gender and development (e.g. Momsen, 2010; Jaquette, 2017) suggests that education is both a precondition and an outcome of women's empowerment, there are no explicit links in literature on women/gender, energy and development between electrification and improved literacy (e.g. time spent reading) (Rewald, 2017). In order to address issues of female illiteracy and the exclusion of women from training, basic literacy and numeracy knowledge transfer should accompany development interventions (Moodie, 2008; Rustagi, 2010; Singh and Kumud, 2013; Jangir and Azeez, 2017). For example, the SMs' intervention shows that the acquisition of some literacy and numeracy supported shifting some participants' status and condition within their household and community. This also partially fulfils international goals on gender equality in education (e.g. UN, 2015 SDG, 4). Additionally, a context specific analysis of local human, social, and material resources (e.g. institutions, hospital, schools) available could reveal whether there is a need for transferring skills. For instance, my focus group discussions with beneficiaries of the SHSs of the Barefoot College revealed women's lack of expertise in revenue generation. On this note, the extreme poverty conditions, in which communities in remote off-grid areas live, are further exacerbated by the lack of energy facilities. Drawing on these insights, I recommend that interventions on energy provision, which aim at contributing to the development of communities, should evaluate the context specific assets, expertise, and skills. Where these are lacking, skills transfer should accompany programmes, also to encourage informal income generation activities, as Haines (2009) and Kilby (2011), for instance, suggest. A step towards women's further empowerment could be for development programmes to encourage the shift of roles and responsibilities within the household (by, for instance, ensuring that women can

use the light for educational, leisure and work purposes).

8.2.2 Reaching out to the rural poor

The remoteness of some of the areas affected by the solar programme raises questions about how to reach out and engage the most rural population in such programmes. The focus group participants said that the engagement of one of them in the training, for instance, would have challenged the perception of gendered roles and responsibilities within their community, and increased women's self-esteem and confidence. A suggestion for development interventions in remote areas whose aim is social inclusion, therefore, would be providing, whenever possible, decentralised training centres closer to remote communities. Where financial and logistical barriers inhibit this decentralisation, offering secure transport facilities for those women living in remote areas, could also be a solution to increase their mobility.

8.2.3 Awareness raising of gender and social inequalities for the whole household

I found that greater and long lasting changes seemed to happen where there was awareness of gender inequalities within the household (e.g. for some STs and SCEs, because their husbands were involved with the NGOs). As a result, I recommend that energy technology training programmes focusing on women's empowerment should include awareness raising interventions for the household as a whole, including men and mothers-in-law. This could challenge patriarchal norms and customs that marginalise women and intergenerational customs that affect intrahousehold gender power dynamics (e.g. mother-in-law towards the daughter-in-law). Awareness raising about social inequality at household level, combined with a focus on literacy and basic education for the solar engineers, could facilitate challenging social and patriarchal norms. As the Solar Mamas' programme shows, the

training on rural energy technology contributes to challenging the prescribed family roles and responsibilities for some women, and men's reluctance to accept change. For instance, I learned that husbands' engagement with the NGOs eases the interviewees' transition from the villages to the College, their participation in the training and in the campus life. It also facilitates the questioning of other taboos, for instance, regarding women's mobility.

8.2.4 Encouraging further development of rural communities through energy access

The solar programme provided off-grid communities with lighting, however, some engineers pointed out that the amount of electricity produced by the SHSs is not enough to promote greater improvements in everyday life. They recognised that there are multiple levels of energy access, and that further electricity power is required to increase people's wellbeing (e.g. by using refrigerators and fans), accommodate cooking needs (e.g. food processors for rice husking), and for financial purposes (e.g. for income generation activities). Access to and use of increased energy capacity (e.g. community solar mini-grids for the use of machineries, fans, fridges, and so on) could ease communities' struggle in their daily survival practices and offer opportunities, for example, for food storage, for the mechanisation of agricultural processes, for income generation activities, and to improve their well-being and comfort at home. Development interventions should take into consideration issues of electricity capacity, reliability and affordability of energy amenities whenever possible in consideration of cost barriers for the implementation of more powerful energy systems (IEA et al., 2018). Providing remote communities with greater energy capacity could address social inequality and injustice concerns and guarantee the ability to satisfy their energy needs.

8.2.5 Addressing problems of design and cost of solar cookers

There are some challenges for women's entrepreneurship in relation to the selling of solar cookers. Problems include: the design of the cookers, their optimal performance in very hot temperatures, and the absence of a market for the solar cookers at community level.

Concerning the design of the solar cooker, the College adopted a flexible and bottom up approach in ensuring the engineers' participation in the design to accommodate rural women's needs when cooking. However, from the participants' accounts, emerged that the parabolic cooker presents several challenges. It requires sufficient space to optimise its performance; therefore, due to its bulkiness, it is not suitable for urban areas (e.g. to be used on balconies). Perhaps an optimised design of clean cooking stoves, or training on improved *chullas* (such as those built by the women on campus) can address these needs and increase the household's nutrition standards.

In relation to performance of the cooker, Rajasthan has a hot climate that makes it difficult to cook with high temperatures. In addition, women told me that cooking at lunchtime is not the best time of the day since in rural areas women usually cook in the morning, before the women themselves and/or members of their family leave for work, and in the evening on their return. Therefore, solutions to the implementation of clean energy cookers should take into consideration the socio-cultural and geographical context to address energy poverty issues and the lack of clean cooking options.

In regard to the cooker selling strategy, although the payment scheme for the cookers is designed by the BC to be accessible by the local communities, the cookers are too expensive for the rural poor. Studies report similar findings and show that even when available, modern energy services are often costly for poor communities (e.g. Practical Action, 2010; Baruah, 2015; Kumar et al., 2016). There is evidence of a 'loop' in regards to addressing energy poverty concerns in the global south; on the one hand,

there is a lack of energy amenities, and on the other hand, when these are provided, they are unaffordable by the rural poor (ibid.). The investment cost of RETs in remote areas is usually high, therefore programmes that offer these options to the rural poor rely on subsidies (Robert et al., 2017). This is also the case for the Barefoot College, which receives sponsorship from national and international trusts and programmes; the communities contribute a certain amount to the solar panels with instalments over three years. Inevitably, the financial sustainability of such programmes is questionable.

In this instance, the Barefoot College evidently has been attentive in promoting women's entrepreneurship and accommodating their needs on campus. The facilitating role of the organisation has been essential to providing an alternative market and to ensuring the economic sustainability of the programme. Perhaps, by using the solar cookers in public services (crèches, schools, field centres, government offices, etc.) the programme is also addressing the nutritional needs of the broader community (the food is cooked better). It would be interesting to explore whether this approach could be adopted internationally in response to global goals seeking equality, good health and wellbeing, and the use of appropriate clean energy (IEA et al., 2018; UN, 2015: SDGs 2 and 3). Another issue concerns the use of fuelwood for cooking. Clean cooking stoves could respond to communities' cooking needs, reduce the smokes, and decrease the risk of diseases (Khandelwal et al, 2017). Therefore, further feminist participatory research on the application of clean cooking stoves could address these limitations.

8.2.6 Ensuring the continuity of the solar engineers' employment and salary

As discussed in Chapter 5, one of the challenges encountered within the SMs' programme is that of the lack of continuity of some of the solar engineers' employment and of their salary. The engineers' salary strictly depends on the economic capacity of

the local communities and/or on the possibility by the BC partner organisations of reintegrating them in other projects and/or programmes. The local partners of the BC rely on external funds; therefore, they are not always able to guarantee the continuity of the engineers' employment if the funds are not available. Additionally, the salary of the SMs is lower than that offered when working as a labourer for the Government. This, perhaps, run counters or does not satisfy their economic interests therefore constraining their participation in the programme. The lack of continuity of employment and of a salary constrains the engineers' economic empowerment and further development that are critical for gender equity and social equality. Ensuring fairly paid permanent jobs for women in the rural energy technology sector in the global south is a recurring challenge, although the ILO claims that there will be increasing investment in RETs with the creation of employment mainly in the infrastructure and technology fields (UNEP, 2011; ILO, 2015).

8.3 Directions for future research

My research is situated within the frames of GED and women's empowerment in development. From the in-depth analysis of the relationship between energy access, rural energy technology training, and women's empowerment that I have carried out in this thesis, significant questions have emerged that require further investigation. These are not questions that can be answered from my case study of BC, but are potential lines of inquiry for future research. Questions include: what kinds of systems and processes are in place at policy, planning, and programme implementation, in regards to energy, in order to ensure social integration and gender equality? How does the 'Barefoot Model' of training contribute to empowerment of rural women in other locations in the global south? Is the cooperative campus model replicable to encourage the empowerment of rural women in other geographical and socio-political contexts? With these considerations in mind, I discuss the opportunity for future research.

Replying to the first question, there is evidence of inconsistency between practice at a grassroots level and policy, as discussed in ENERGIA (2016), it would be interesting to explore ways to promote a more efficient, effective, and continuous dialogue between theory and practice. More effort should be made to translate practice into policy to create gender-sensitive and socially progressive policies and programmes and vice versa to apply gender-aware policy at the grassroots level (Danielsen, 2012). When implementing energy projects and programmes affecting women, supporting services (including training on entrepreneurship in energy technology), advocacy, and awareness raising are central (Danielsen, 2012). It appears that the interconnection between women's empowerment and sustainable development is often discounted in policy making and in practice at a grassroots level (Danielsen, 2012). Without instrumentalising women, their contribution to the social, economic and political fabric of the society is often overlooked even though it is critical for development. Failing to recognise women's role, influence, knowledge and expertise constrains broader social transformation and change. The empowerment of women is essential to achieving social equality and justice internationally (UN, 2015). In order to achieve greater goals, such as environmental sustainability and energy transition in face of climate change, further research is required to investigate context-specific socio-cultural, economic and political constraints on the adoption of energy services and implementation of training that can facilitate women's empowerment.

Concerning the second question, the 'Barefoot Model' of knowledge transfer has been judged to be successful in transferring skills and in providing an income to rural women (e.g. Oparaocha and Dutta, 2011; Winther et al., 2018). As a result, the model has been implemented in about 93 countries of the global south. Nevertheless, future research could explore whether it has contributed, in other countries, to the empowerment of rural women engaged with it beyond acquiring expertise and an income, including raising their awareness, and enabling them to question, and

challenge constraints on their empowerment. In addition, further investigation could disclose which kinds of changes happen in women's lives after the training in relation to their agency, freedom of choice, entrepreneurship, and leadership in energy technology within their socio-cultural and political context.

Regarding the third question, with the limitations discussed before in mind (e.g. cost and lack of financial security of the training model), extensions to this research could include exploring the extent to which the campus cooperative living model could be implemented in other countries. This represents a new approach to knowledge-sharing in the fields of gender and energy, and offers additional features (as explored above) to popular education for poor communities. This model is not a blueprint; therefore, the research should consider contextual social, cultural, political, economic and environmental features. I suggest that this should be complemented by an evaluation of local needs and assets (Haines, 2009; Kilby, 2011) by engaging the local communities themselves. A participatory approach that engages the community as a whole, could also contribute to challenging customs and people's mindset to achieve 'transformative' and long-lasting change. Moreover, I recommend further research on the design and implementation of clean cooking stoves, their implications for women's empowerment, and to respond to global nutritional, health and environmental concerns, as I have suggested in section 8.2. For intsnce, Kooijman et al. (2018), recognise several constraints on the adoption of clean improved cookers.

8.4 Final remarks

My thesis shows that rather than being victims, women can be agents of social change in the rural energy technology field (Kooijman et al, 2018). Technical and economic solutions to global issues such as climate change and the energy transition appear to be inadequate (Prebble and Rojas, 2017). There is a need to invest more in participatory development interventions, such as that of the Barefoot College, which

encourage social transformation and facilitate the empowerment process of marginalised rural women. These kinds of interventions are critical especially in areas, such as rural Rajasthan, shaped by strong beliefs and customs that discriminate against women and girls. Empowered women can bring about social change and contribute to the sustainable development of their family and communities. Initiatives on energy access and energy technology knowledge transfer are critical strategies for empowerment and can translate in gender-aware and progressive energy policies and programmes to address global issues of social inequality and injustice. Therefore, in offering a case study of the SMs' programme of the BC, my research contributes original insights to international debates on climate change, energy poverty, women's empowerment and social equality.

List of references

Adhikari, B., Di Falco, S. and Lovett, J.C. (2004). Household characteristics and forest dependency: evidence from common property forest management in Nepal. *Ecological Economics.* 48 (2), pp. 245-257.

Agarwal, B. (1992). The gender and environment debate: lessons from India. *Feminist studies.* 18 (1), pp. 119-158.

Agarwal, B. (1994a) Positioning the Western Feminist Agenda: A Comment. *Indian Journal of Gender Studies*. 1 (2), pp. 249-255.

Agarwal, B. (1994b). Gender and command over property: A critical gap in economic analysis and policy in South Asia. *World Development.* 22 (10), pp. 1455-1478.

Agarwal, B. (1997a). Gender, environment, and poverty interlinks: Regional variations and temporal shifts in rural India, 1971–1991. *World Development.* 25 (1), pp. 23-52.

Agarwal, B. (1997b). "Bargaining"and Gender Relations: Within and Beyond the Household. *Feminist economics.* 3 (1), pp. 1-51.

Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World Development.* 29 (10), pp. 1623-1648.

Agarwal, B. (2009). Gender and forest conservation: The impact of women's participation in community forest governance. *Ecological Economics.* 68 (11), pp. 2785-2799.

Agarwal, B. (2015). The power of numbers in gender dynamics: illustrations from community forestry groups. *Journal of Peasant Studies.* 42 (1), pp. 1-20.

Agarwal, B. (2016). *Gender Challenges: Volumes 1, 2 and 3.* 1st edn. New Delhi: Oxford University Press.

Agarwal, B. (2018a). Can group farms outperform individual family farms? Empirical insights from India. *World Development*, 108, pp. 57-73.

Agarwal, B. (2018b). Gender equality, food security and the sustainable development goals. *Current opinion in environmental sustainability*, 34, pp. 26-32.

Agoramoorthy, G. and Hsu, M.J. (2009). Lighting the lives of the impoverished in India's rural and tribal drylands. *Human Ecology.* 37 (4), pp. 513-517.

Aguilar, L., Araujo, A. and Quesada-Aguilar, A. (2004). *Gender and climate change.* Fact Sheet. San José, CR: International Union for Conservation of Nature.

Aguilar, L., Araujo, A. and Quesada-Aguilar, A. (2007). *Reforestation, afforestation, deforestation, climate change and gender.* Fact Sheet. San Jose', CR: international union for conservation of nature.

Ahamad, T., Hemlata, E. and Narayana, A. (2015). The role of NGOs in women empowerment with special reference to Uttar Pradesh. *International Journal of Applied Research*. 1 (10), pp. 115-118.

Ahamad, T. and Mishra, A.K. (2016). Legal status and rights of women in Indian constitution. *International Journal of Advanced Education and Research.* 1 (1), pp. 39-42.

Ahmad, B. (2001). Users and disusers of box solar cookers in urban India-Implications for solar cooking projects. *Solar Energy.* 69 (6), pp. 209-215.

Ahmad, T., Hemlata, E. and Narayana, A. (2015). The role of NGOs in women empowerment with special reference to Uttar Pradesh. *International Journal of Applied Research*. 1 (10), pp.115-118.

Aklin, M., Cheng, C.Y., Urpelainen, J., Ganesan, K. and Jain, A. (2016). Factors affecting household satisfaction with electricity supply in rural India. *Nature Energy*, 1 (11), pp.16170.

Aklin, M., Bayer, P., Harish, S.P. and Urpelainen, J. (2018). Persistent Energy Poverty in India. In: Aklin, M., Bayer, P., Harish, S.P. and Urpelainen, J. *Escaping the Energy Poverty Trap: When and how Governments Power the Lives of the Poor*. Cambridge, MA: MIT Press.

Alcoff, L. and Potter, E. (2013). *Feminist epistemologies.* New York and London: Routledge.

Amadiume, I. (1987). *Male daughters, female husbands: Gender and sex in an African society.* London and New Jersey: Zed Books.

Amadiume, I. (2000). *Daughters of the goddess, daughters of imperialism African women struggle for culture, power and democracy.* London: Zed Books.

Amplifier Strategies (2016). *Barefoot White Paper-The Barefoot Model for Global Sustainability.* San Francisco: Amplifier Strategies.

Anand, J.S. (2002). *Self-help groups in empowering women: Case study of selected SHGs and NHGs.* Kerala Research Programme on Local Level Development-Discussion Paper. Thiruvananthapuram: Centre for Development Studies.

Annecke, W.J. (2003). One man, one megawatt, one women one candle: women, gender, and energy in South Africa. *ENERGIA News.* 6 (1), pp. 6-8.

Apple, M.W. (2013). *Education and power.* 2nd edn. London and New York: Routledge.

Arnfred, S. (2002). Questions of Power: Women's Movements Feminists Theory and Development Aid. In: Sisask, A. (ed.) *Discussing Women's Empowerment–Theory and practice.* vol. 3. Stockholm: Swedish International Development Agency.

Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change.* 21 (2), pp. 744-751.

Aurino, E. (2017). Do boys eat better than girls in India? Longitudinal evidence on dietary diversity and food consumption disparities among children and adolescents. *Economics & Human Biology.* [Online] 25, pp. 99-111.

Baden, S. and Goetz, A.M. (1997). Who needs [sex] when you can have [gender]? Conflicting discourses on gender at Beijing. *Feminist review.* 56 (1), pp. 3-25.

Barefoot College (2012). *Disrupting poverty: How Barefoot College is empowering women...* Available from: https://www.barefootcollege.org/disrupting-poverty-how-barefoot-college-is-empowering-women/ [Accessed, April, 2019].

Barefoot College (2015a). *Annual Report (2014-2015).* Tilonia: Barefoot College.

Barefoot College (2015b). *Progress report solar department.* Tilonia: Barefoot College.

Barefoot College (2015c). *Volunteer Info Pack.* Tilonia: Barefoot College.

Barefoot College (2015d). *How to establish a community solar.* Tilonia: Barefoot College.

Barefoot College (2015e). *Three-Year 2015-2018 Strategic Focus. Powering the future we believe in.* Tilonia: Barefoot College.

Barefoot College (2017). *UPDATE: Solar school and digital capacity building.* vol. Newsletter-24th May. Tilonia: Barefoot College.

Barefoot College (2019). *At Barefoot, we harness the power of the sun*. Available from: https://www.barefootcollege.org/solution/solar/ [Accessed, July, 2019].

Barnes, D.F., Openshaw, K., Smith, K.R., Van der Plas, R. and Mundial, B. (1994). *What Makes People Cook with Improved Biomas Stoves?* Washington D.C.: Banco Mundial.

Bast, E., Krishnaswamy, S., Mainhardt-Gibbs, H. and Romine, T. (2011). *Access to energy for the poor: the clean energy option.* Washington: OliChange Foundation, ActionAid and Vasudha Foundation.

Batliwala, S. (1993). Empowerment of Women in South Asia: Concept and Practices. *ASSBAF and FAO, Fredom from Hunger Campaign, Action and Development.* New Delhi: FAO, FFHC/AD.

Batliwala, S. (1994a). The meaning of women's empowerment: new concepts from action. In: Sen, G. and Adrienne Germain and Lincoln C. Chen (eds.) *Population policies reconsidered: health, empowerment, and rights.* March edn. Boston

Massachusetts: Harvard University Harvard Center for Population and Development Studies.

Batliwala, S. (1994b). *Women's empowerment in South Asia: Concepts and practices.* New Delhi: Asian South Pacific Bureau of Adult Education.

Batliwala, S. (2007). *Putting power back into empowerment.* Available from: https://s3.amazonaws.com/academia.edu.documents/33307000/Putting_power_back_into_empowerment.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1554817111&Signature=lDFSEfiKePuMbFZSE3sKRdwzHF8%3D&response-content-disposition=inline%3B%20filename%3DPutting_power_back_into_empowerment.pdf. [Accessed: April 2019].

Batliwala, S. (2010). Taking the power out of empowerment–an experiential account. *Development in practice.* 17 (4-5), pp. 557-565.

Batliwala, S. (2015). *Engaging with Empowerment. An intellectual and experiential journey.* 2nd edn. New York: Women Unlimited.

Batliwala, S. and Dhanraj, D. (2004). Gender myths that instrumentalise women: a view from the Indian frontline. *ids Bulletin.* 35 (4), pp. 11-18.

Batliwala, S. and Reddy, A.K.N. (2003). Energy for women and women for energy (engendering energy and empowering women). *Energy for Sustainable Development.* 7 (3), pp. 33-43.

Batra, R. and Reio Jr, T.G. (2016). Gender inequality issues in India. *Advances in Developing Human Resources.* 18 (1), pp. 88-101.

Becker, M., Vignoles, V.L., Owe, E., Brown, R., Smith, P.B., Easterbrook, M., Herman, G., De Sauvage, I., Bourguignon, D. and Torres, A. (2012). Culture and the distinctiveness motive: Constructing identity in individualistic and collectivistic contexts. *Journal of personality and social psychology.* 102 (4), pp. 833-855.

Beneria, L. and Sen, G. (1982). Class and gender inequalities and women's role in economic development: Theoretical and practical implications. *Feminist Studies.* 8 (1), pp. 157-176.

Beneria, L. (1999). Globalization, gender and the Davos Man. *Feminist Economics.* 5 (3), pp. 61-83.

Beri, R. (2011). *Evolving India–Africa Relations: Continuity and Change.* Occasional Paper N. 72-Emerging Powers and Global Challenges Programme. Johannesburg: South African Institute of International Affairs (SAIIA).

Bertaux, N. and Crable, E. (2007). Learning about women's economic development, entrepreneurship and the environment in India: A case study. *Journal of Developmental Entrepreneurship.* 12 (04), pp. 467-478.

Bhattacharyya, S.C. (2006). Energy access problem of the poor in India: Is rural electrification a remedy? *Energy Policy.* 34 (18), pp. 3387-3397.

Bhattacharyya, S.C. and Palit, D. (2016). Mini-grid based off-grid electrification to enhance electricity access in developing countries: What policies may be required? *Energy Policy.* 94 (July), pp. 166-178.

Bhattacherjee, A. (2012). *Social Science Research: principles, methods, and practices.* 2nd edn. Florida: Global Text Project.

Bhogle, S. (2003). Rural women as agents of improved woodstove dissemination: a case-study in Huluvangala village, Karnataka, India. *Energy for Sustainable Development.* 7 (3), pp. 70-75.

Bidner, C. and Eswaran, M. (2015). A gender-based theory of the origin of the caste system of India. *Journal of Development Economics.* 114, pp. 142-158.

Bloomfield, E. (2014). *Gender and Livelihoods Impacts of Clean Cookstoves in South Asia.* Rugby: Practical Action.

Bourdieu, P. (1977). *Outline of a Theory of Practice.* Vol. 16. Cambridge: Cambridge University Press. ahma

Bray, F. (2013). *Technology, gender and history in imperial China: great transformations reconsidered.* London: Routledge.

Brew-Hammond, A. (2010). Energy access in Africa: Challenges ahead. *Energy Policy.* 38 (5), pp. 2291-2301.

Brooks, A. (2007). Feminist standpoint epistemology: Building knowledge and empowerment through women's lived experience. In: Hesse-Biber S. and Leavy, P. (eds.) *Feminist research practice: A primer*, pp.53-82.

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., Hauff, V., Lang, I., Shijun, M. and de Botero, M.M. (1987). *Our common future.* Oxford: Oxford University Press, USA.

Bryman, A., (1988). *Quantity and quality in social research*. Vol. 18. London: Routledge.

Bryman, A. (2008). *Social research methods.* 3rd edn. Oxford: Oxford university press.

Bryman, A. (2012). *Social research methods.* 4th edn. Oxford: Oxford University Press.

Buragohain, T. (2012a). Renewable Energy and Rural Environment in India: Challenges Ahead. In: *2012 International conference on environment, energy and biotechnology IPCBEE.* 5-6th May. Singapore: IACSIT Press, pp. 139-143.

Buragohain, T. (2012b). Impact of solar energy in rural development in India. *International journal of environmental science and development.* 3 (4), pp. 334-338.

Burnham, P., Gilland, K., Grant, W. and Layton-Henry, Z. (2008). *Research methods in politics.* 2nd edn. Basingstoke: Palgrave Macmillan.

Campbell, R. and Wasco, S.M. (2000). Feminist approaches to social science: Epistemological and methodological tenets. *American Journal of Community Psychology.* 28 (6), pp. 773-791.

Carney, J. (1992). Peasant women and economic transformation in The Gambia. *Development and Change.* 23 (2), pp. 67-90.

Caudle, S.L. (2004). Qualitative data analysis. In: Wholey, J.S. et al. (ed.) *Handbook of practical program evaluation.* 2nd edn. San Francisco: Jossey-Bass.

Cecchini, S. and Scott, C. (2003). Can information and communications technology applications contribute to poverty reduction? Lessons from rural India. *Information Technology for Development.* 10 (2), pp. 73-84.

Cecelski, E. (1995). From Rio to Beijing: Engendering the energy debate. *Energy Policy.* 23 (6) , pp. 561-575.

Cecelski, E. (2000a). *Enabling equitable access to rural electrification: current thinking and major activities in energy, poverty and gender.* 1. Washington, D.C.: Asia Alternative Energy Unit The World Bank.

Cecelski, E. (2000b). *The Role of Women in Sustainable Energy Development.* Colorado: National Renewable Energy Laboratory (NREL).

Cecelski, E. (2004). *Re-thinking gender and energy: Old and new directions.* May. Leusden: ENERGIA/EASE.

Cecelski, E. (2005). *Energy, Development and Gender: Global Correlations and Causality.* KaR research project R8346. London: DFID.

Cecelski, E. (2006). *From the Millennium Development Goals towards a gender-sensitive energy policy research and practice: Empirical evidence and case studies.* Leusden: ENERGIA/DfID Collaborative Research Group on Gender and Energy.

Chakrabarti, S. and Chakrabarti, S. (2002). Rural electrification programme with solar energy in remote region–a case study in an island. *Energy Policy.* 30 (1), pp. 33-42.

Chandhoke, N. (1995). *State and civil society: Explorations in political theory.* New Delhi: SAGE Publications Pvt. Limited.

Chant, S. (2006). Contributions of a gender perspective to the analysis of poverty. In: Jaquette, J. and Summerfield, G. (eds.) *Women and Gender Equity in Development*

Theory and Practice: Institutions, Resources and Mobilisation. Duke University Press, Durham, North Carolina: Duke University Press.

Chant, S. (2008). The 'feminisation of poverty'and the 'feminisation'of anti-poverty programmes: Room for revision? *The Journal of Development Studies.* 44 (2), pp. 165-197.

Chant, S. (2016). Women, girls and world poverty: empowerment, equality or essentialism?. International Development Planning Review, 38 (1), pp.1-24.

Charmes, J. and Wieringa, S. (2003). Measuring women's empowerment: an assessment of the gender-related development index and the gender empowerment measure. *Journal of Human Development.* 4 (3), pp. 419-435.

Charmaz, K. (1983). The grounded theory method: An explication and interpretation. In: Emerson, R.M. (ed.) *Contemporary field research*. *A Collection of Readings*, pp.109-126. Prospect Heights, IL: Waveland Press.

Chaurey, A., Ranganathan, M. and Mohanty, P. (2004). Electricity access for geographically disadvantaged rural communities—technology and policy insights. *Energy Policy.* 32 (15), pp. 1693-1705.

Chopra, D. and Müller, C. (2016). Connecting perspectives on women's empowerment. IDS Bulletin, Transforming Development Knowledge, 47 (1).

Clancy, J.S., Skutsch, M. and Batchelor, S. (2002). *The Gender-Energy-Poverty Nexus: Finding the energy to address gender concerns in development.* London: UK Department for International Development (DFID).

Clancy, J.S. (2003). *Gender and Household Energy Concerns: the Global Context.* Briefing Paper 2. Brussels: SPARKNET.

Clancy, J. and Roehr, U. (2003). Gender and energy: is there a Northern perspective? *Energy for Sustainable Development.* 7 (3), pp. 44-49.

Clancy, J., Oparaocha, S. and Roehr, U. (2004). Gender Equity and Renewable Energies. Thematic Background Paper. In: *International Conference for Renewable*

Energies. 1-4th June. Bonn: Secretariat of the International Conference for Renewable Energies, pp. 1-30.

Clancy, J. and Dutta, S. (2005). Women and Productive Uses of Energy: Some light on a shadowy area. In: *UNDP Meeting on Productive Uses of Renewable Energy.* 9-11 May. 9. Bangkok, Thailand, 9-11 May.

Clancy, J., Winther, T., Matinga, M. and Oparaocha, S. (2012). *Gender equity in access to and benefits from moder energy and improved energy technologies. World Development Report background Paper.* Leusden: ETC/ENERGIA.

Clemens, H., Bailis, R., Nyambane, A. and Ndung'u, V., 2018. Africa Biogas Partnership Program: A review of clean cooking implementation through market development in East Africa. *Energy for Sustainable Development*. 46, pp.23-31.

Code, L. (2013). Taking subjectivity into account. In: Alcoff, L. and Potter, E. (eds.) *Feminist epistemologies.* New York and London: Routledge.

Cook, I. (2005). Particpant Observation. In: Flowerdew, R. and Martin, D. (eds.) *Methods in human geography: a guide for students doing a research project.* 2nd edn. Harlow: Pearson Education.

Corbridge, S. (2009). North/South. In: Gregory, D. et al. (ed.) *The dictionary of human geography.* 5th edn. Hoboken: John Wiley & Sons.

Cornwall, A. (2003). Whose voices? Whose choices? Reflections on gender and participatory development. *World Development.* 31 (8), pp. 1325-1342.

Cornwall, A., Harrison, E., and Whitehead, A., 2007. *Feminisms in development: Contradictions, contestations and challenges*. London: Zed Books.

Cornwall, A., Harrison, E. and Whitehead, A. (2007). Gender myths and feminist fables: The struggle for interpretive power in gender and development. *Development and Change.* 38 (1), pp. 1-20.

Cornwall, A. and Eade, D., 2010. *Deconstructing development discourse: Buzzwords and fuzzwords*. Rugby: Practical Action and Oxfam GB.

Cornwall, A. and Edwards, J. (2010). Introduction: negotiating empowerment. *IDS Bulletin.* 41 (2), pp. 1-9.

Cornwall, A. (2016). Women's Empowerment: What Works? *Journal of International Development.* 28 (3), pp. 342-359.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stan.L.Rev.* 43 (6), pp. 1241-1299.

Creswell, J.W. (2003). *Research Design: Quantitative and Mixed Methods Approaches.* 2nd edn. Thousand Oaks: Sage.

Crouch, M. and McKenzie, H. (2006). The logic of small samples in interview-based qualitative research. *Social science information.* 45 (4), pp. 483-499.

Cuce, E. and Cuce, P.M. (2013). A comprehensive review on solar cookers. *Applied Energy.* 102, pp. 1399-1421.

Danielsen, K. (2012). *Gender equality, women's rights and access to energy services.* Copenhagen: Ministry of Foreign Affairs of Denmark.

Dankelman, I. (2002). Climate change: Learning from gender analysis and women's experiences of organising for sustainable development. *Gender & Development.* 10 (2), pp. 21-29.

Dankelman, I. (2010). *Gender and climate change: An introduction.* London: Earthscan.

Das, R. (2008). Nation, Gender and Representations of (In) Securities in Indian Politics: Secular-Modernity and Hindutva Ideology. *European Journal of Women's Studies.* 15 (3), pp. 203-221.

Dasgupta, P. (2017). Women Alone: The Problems and Challenges of Widows in India. *International Journal of Humanities and Social Sciences (IJHSS).* 6 (6), pp. 35-40.

Dasgupta, S. and Sankhyayan, P. (2018). A Narrative Analysis of State-Level Renewable Energy Policies in India. In: Gautam, A. et al. (eds.) *Sustainable Energy and Transportation. Energy, Environment, and Sustainability.* Singapore: Springer.

Datta, P.B. and Gailey, R. (2012). Empowering women through social entrepreneurship: Case study of a women's cooperative in India. *Entrepreneurship theory and Practice.* 36 (3), pp. 569-587.

Dawson, J. (2006). *Ecovillages: new frontiers for sustainability.* vol. Schumacher briefing N.12. Totnes: Green Books.

de Groot, J., Mohlakoana, N., Knox, A. and Bressers, H. (2017). Fuelling women's empowerment? An exploration of the linkages between gender, entrepreneurship and access to energy in the informal food sector. *Energy Research & Social Science.* 28, pp. 86-97.

De Vaus, D. (2001). *Research design in social research.* 1st edn. London: Sage.

Denscombe, M. (2010). *Ground rules for social research: Guidelines for good practice.* 2nd edn. Maidenhead: McGraw-Hill Education (UK).

Denscombe, M. (2014). *The good research guide: for small-scale social research projects.* 5th edn. Maidenhead: Open University Press.

Department of Energy Government of Rajasthan (DEGR) (2014). *Solar for a Brighter Future - Rajasthan Solar Energy Policy.* Jaipur: Government of Rajasthan.

Derbyshire, H. (2002). *Gender Manual: A practical guide for development policy makers and practitioners.* April. London: DFID.

Desai, S., Dubey, A., Joshi, B.L., Sen, M., Shariff, A. and Vanneman, R. (2010). *Human development in India.* New Delhi: Oxford University Press.

Desai, S. and Temsah, G. (2014). Muslim and Hindu women's public and private behaviors: gender, family, and communalized politics in India. *Demography.* 51 (6), pp. 2307-2332.

Deshpande, S. and Sethi, S. (2009). Women entrepreneurship in India. *International Research Journal.* 2 (9), pp. 13-17.

Dey, I. (2003). *Qualitative data analysis: A user friendly guide for social scientists.* 2nd edn. London: Routledge.

Dhanraj, D., Batliwala, S. and Misra, G. (2002). Facing the future: a South Asian Perspective on Challenges for the Women's Movement. In: *AWID Ninth Forum,"Re-inventing Globalization", Guadalajara, Mexico.* 3rd-6th October. 3. 3rd-6th October. Amsterdam: Mama Cash: 10.

Dhar, D., Jain, T. and Jayachandran, S. (2018). Intergenerational transmission of gender attitudes: Evidence from India. *The Journal of Development Studies.* 55 (12), pp. 2572-2592

Duflo, E. (2011). Women empowerment and economic development. *Journal of Economic Literature.* 50 (4), pp. 1051-1079.

Dutta, S. (2003). *Mainstreaming Gender in Energy Planning and Policies.* Background Paper For Expert Group Meeting. New York: UNDP.

Dutta, S., Kooijman, A. and Cecelski, E. (2017). *Energy access and gender: getting the right balance.* SEAR special feature. Washington D.C.: World Bank.

Dutta, S. (2019). *Supporting last-mile women energy entrepreneurs: What works and what does not.* The Hague: ENERGIA.

Elkington, J. and Hartigan, P. (2013). *The power of unreasonable people: How social entrepreneurs create markets that change the world.* Boston: Harvard Business Press.

Ellis, P. (1990). *Measures increasing the participation of girls and women in technical and vocational education and training: A Caribbean study.* London: Commonwealth Secretariat.

Encyclopaedia Britannica (2018). *Purdah Islamic Custom.* Available from: https://www.britannica.com/topic/purdah. [Accessed: April, 2019].

Encyclopaedia Britannica (2019). *Rajput. Indian History*. Available from: https://www.britannica.com/topic/Rajput. [Accessed: April, 2019]

ENERGIA (2016). *Women and energy entrerpreneurship. Business models for off-grid energy and social impact. Part II.* [Online] 11th August 2016. Available from: http://e4sv.org/events/women-energy-entrepreneurship-business-models-off-grid-energy-social-impact-part-ii/. [Accessed: April, 2019].

ENERGIA (2018). *Who we are.* Available from: http://www.energia.org/who-we-are.

England, K.V., (1994). Getting personal: Reflexivity, positionality, and feminist research. The professional geographer, 46 (1), pp.80-89.

Ergas, C. (2010). A model of sustainable living: Collective identity in an urban ecovillage. *Organization & Environment.* 23 (1), pp. 32-54.

Escobar, A. (2011). *Encountering development: The making and unmaking of the Third World.* second edn. Princeton: Princeton University Press.

Evans, K. (1995). Barriers to participation of women in technological education and the role of distance education. *The Commonwealth of Learning.* 6 (2) .

Feenstra, M. (2002). *Toward a gender-aware energy policy: a case study from South Africa and Uganda*, University of Twente.

Feenstra, M. and Özerol, G. (2018). Using energy justice as a search light for gender and energy policy research: A systematic review. In: *12th ECPR General Conference 2018.* 22-25th August. Hambourg: University of Hambourg.

Feldman, S. (1997). NGOs and civil society:(Un) stated contradictions. *The Annals of the American Academy of Political and Social Science.* 554 (1), pp. 46-65.

Fernandes, L. (2004). The politics of forgetting: Class politics, state power and the restructuring of urban space in India. *Urban Studies.* 41 (12), pp. 2415-2430.

Fernández-Baldor, Á., Boni,A., Lillo, P., and Hueso, A.. (2014). Are Technological Projects Reducing Social Inequalities and Improving People's Well-Being? A Capability Approach Analysis of Renewable Energy-Based Electrification

Projects in Cajamarca, Peru. *Journal of Human Development and Capabilities* 15(1), pp.13–27.

Fernando, J.L. and Heston, A.W. (1997). Introduction: NGOs between states, markets, and civil society. *The ANNALS of the American Academy of Political and Social Science.* 554 (1), pp. 8-20.

Fierlbeck, K. (1995). Getting representation right for women in development: accountability, consent, and the articulation of women's interests. *IDS Bulletin.* 26 (3), pp. 23-30.

Flick, U. (2018). *Triangulation in data collection*. *The SAGE Handbook of Qualitative Data Collection.* London, UK: SAGE Publications.

Folbre, N. (1994). *Who pays for the kids?: gender and the structures of constraint.* vol. 4. Taylor & Francis US.

Foster, D. and Dale, J. (1986). *Feminists and State Welfare.* first edn. London: Routledge & Kegan Paul.

Franklin, C., Ballan, M. and Thyer, B., 2010. Reliability and validity in qualitative research. In: Thyer, B. (ed.), *The handbook of social work research methods*. 2nd edn, pp.273-292. Los Angeles: SAGE.

Fraser, N. (2013). *Fortunes of feminism: From state-managed capitalism to neo-liberal crisis*. London: Verso.

Freire, P. (1970). Pedagogy of the oppressed (MB Ramos, Trans.). *New York: Continuum.* 72, pp. 43-70.

Freire, P. (1985). *The politics of education: Culture, power, and liberation.* Greenwood Publishing Group.

Freire, P. (1998). *Pedagogy of freedom: Ethics, democracy, and civic courage.* 1st edn. Oxford: Rowman & Littlefield Publishers.

Funk, P.A. (2000). Evaluating the international standard procedure for testing solar cookers and reporting performance. *Solar Energy.* 68 (1), pp. 1-7.

Gangopadhyay, M., 2010. *Hindutva meets globalization: The impact on Hindu Urban media women*, Florida International University.

Gibbs, G. (2002). *Qualitative data analysis: Explorations with NVivo (Understanding social research).* Buckingham: Open University Press.

Giddens, A. (1982). Class division, class conflict and citizenship rights. In: Giddens, A. (ed.) *Profiles and critiques in social theory.* London: Palgrave.

Gilman, R. (1991). The Ecovillage Challenge: The Challenge of Developing a Community Living in Balanced Harmony—with Itself as We as Nature—is Tough, but Attainable. *Context Institute.* Summer (29), pp. 10-14.

Goetz, A.M. (1988). Feminism and the Limits of the Claim to Know: Contradictions in the Feminist Approach to Women in Development. *Millennium-Journal of International Studies.* 17 (3), pp. 477-496.

Goetz, A.M. and Gupta, S.R. (1994). Who takes the credit? Gender, power and control over loan use in rural credit programmes in Bangladesh. *World Development.* 24 (1) pp. 45-63.

Goetz, A.M. (1995a). Institutionalizing women's interests and accountability to women in development. *IDS bulletin.* 26 (3), pp. 1-10.

Goetz, A.M. (1995b). *The politics of integrating gender to state development processes: Trends, opportunities and constraints in Bangladesh, Chile, Jamaica, Mali, Morocco and Uganda.* Occasional Paper. Geneva: UNRISD.

Government of India (GOI) (2001). *National Perspective Plan for the Empowerment of Women.* New Delhi: Ministry of Women and Child Development.

Government of India (2005). *The Mahatma Gandhi National Rural Employment Guarantee Act.* Available from: https://nrega.nic.in/netnrega/home.aspx. [Accessed: April, 2019]

Government of India (2006). *Rajasthan development report.* Planning Commission Government of India. New Delhi: Academic Foundation.

Government of India (2008). *Indian Government's National Action Plan on Climate Change (NAPCC).* New Delhi: GOI.

Government of India (2011). *Census.* New Delhi: Ministry of Home Affairs.

Government of India (2016). *Pradhan Matri Ujjwala Yojana.* [Online] 2016. Available from: http://www.pmujjwalayojana.com/about.html. [Accessed: April, 2019].

Government of India (2017). *National Energy Policy.* New Delhi: Government of India.

Government of India (2019). *National Commission for Women.* Available from: http://ncw.nic.in/frmabtbreifhistory.aspx. [Accessed: April, 2019].

Govindan, M. and Palit, D. (2017). *A glaring omission in India's energy policy: gender justice.* [Online] 13th October. Available from: https://medium.com/energy-access-india/a-glaring-omission-in-indias-energy-policy-gender-justice-afc63375eb20. [Accessed: April, 2019].

Goyal, M. and Parkash, J. (2011). Women entrepreneurship in India-problems and prospects. *International Journal of Multidisciplinary Research.* 1 (5), pp. 195-207.

Green, C., Joekes, S. and Leach, M. (1998). Questionable links: Approaches to gender in environmental research and policy. In: Jackson, C. and Pearson, R. (eds). *Feminist Visions of Development: Gender Analysis and Policy*. London: Routledge.

Green, G.P. and Haines, A., 2015. *Asset building and community development*. London: Sage publications.

Green, M. (2001). Solar Cookers as a Mechanism for Women's Empowerment. In: *ISES World Solar Congress, Adelaide, Australia.*

Greene, J.C., Caracelli, V.J. and Graham, W.F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis.* 11 (3), pp. 255-274.

Gregory, D., Johnston, R., Pratt, G., Watts, M. and Whatmore, S. (2009). *The dictionary of human geography.* 5th edn. Chichester: John Wiley & Sons.

Groff, C. (2017). *The Ecology of Language in Multilingual India: Voices of Women and Educators in the Himalayan Foothills.* London: Palgrave Macmillan.

Grosser, K. and McCarthy, L. (2018). Imagining new feminist futures: How feminist social movements contest the neoliberalization of feminism in an increasingly corporate-dominated world. *Gender, Work & Organization*, 26, pp. 1110-1116.

Guba, E.G. and Lincoln, Y.S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research.* 2 (163-194), pp. 105-117.

Gull, R. and Shafi, A. (2014). Indian Women's Movement after Independence. *International Research Journal of Social Sciences.* 3 (5), pp. 35-65.

Gupta, D. (2009). Disparities in Development, Status of Women and Social Opportunities: Indian Experience. *Journal of Alternative Perspectives in the Social Sciences.* 1 (3), pp. 687-719.

Gupta, M. (2009). *Marching Together: Resisting Dowry in India.* New Delhi: Jagory.

Haines, A., 2009. Asset-based community development. In: Phillips, R and Pittman, S.H. (eds). *An introduction to community development*, 2nd edn., pp. 45-56. London: Routledge.

Hakim, C. (1987). *Research design: Strategies and choices in the design of social research.* Crows Nest: Allen and Unwin.

Handy, F., Kassam, M. and Contact, P. (2004). Women's empowerment in rural India. In: *International Society for Third Sector Research Conference.* 11-14th July. Toronto: Ryerson University and York University, pp. 1-18.

Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist studies.* 14 (3), pp. 575-599.

Haraway, D. (2013). *Simians, cyborgs, and women: The reinvention of nature.* New York: Routledge.

Harding, S. (1991). *Whose science. Whose knowledge.Thinking from women's lives.* Ithaca: New Cornell University Press.

Harding, S. (1986). *The science question in feminism.* Ithaca and London: Cornell University Press.

Harzing, A. (2005). Does the use of English-language questionnaires in cross-national research obscure national differences? *International Journal of Cross Cultural Management.* 5 (2), pp. 213-224.

Havet, I. (2003). Linking women and energy at the local level to global goals and targets. *Energy for sustainable development.* 7 (3), pp. 75-79.

Hayward, C.R. (1998). *De-facing power.* Cambridge: Cambridge University Press.

Hesse-Biber, S. and Leavy, P. (2007). *Feminist research practice: A primer.* Thousand Oaks: Sage Publications.

Hesse-Biber and Leavy (2011). *The practice of qualitative research*. Sage: London.

Hesse-Biber, S. (2012). Feminist approaches to triangulation: Uncovering subjugated knowledge and fostering social change in mixed methods research. *Journal of Mixed Methods Research.* 6 (2), pp. 137-146.

Hirschmann, D. (1998). Civil society in South Africa: Learning from gender themes. *World Development.* 26 (2), pp. 227-238.

Hughes, K.P. (1996). Education for liberation? Two Australian contexts. In: Walters, S. and Manicom, L. (eds.) *Gender in Popular Education. Methods for Empowerment.* 2nd edn. London and New Jersey: CACE and Zed Books.

Humphries, B. (1996). *Critical perspectives on empowerment.* Birmingham: Venture Press.

Ibrahim, S. and Alkire, S. (2007). Agency and empowerment: A proposal for internationally comparable indicators. *Oxford development studies.* 35 (4), pp. 379-403.

IEA, IRENA, UN Statistics Group, WBG and WHO (2018). *Tracking SDG7: The Energy Progress Report.* Washington D.C.: World Bank.

International Energy Agency (2002). *World Energy Outlook.* Paris: OECD/IEA.

International Federation of Workers' Education Association (IFWEA) (2019). *India Self-employed Women's Association (SEWA) Women's Leadership Course, and Pakistan Education Foundation (LEF) Gender equity Course via IFWEA Online Labour Academy (OLA).* Available from: http://www.ifwea.org/india-self-employed-womens-association-sewa-womens-leadership-course-pakistan-labour-education-foundation-lef-gender-equity-course-via-ifweas-online-labour-academy/. [Accessed: April, 2019].

International Labour Organisation (ILO) (2015). *Gender equality and green jobs*. ILO: Geneva.

International Panel on Climate Change (IPCC) (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)].* Geneva: IPCC.

International Renewable Energy Agency (IRENA) (2018). *Renewable Energy Market Analysis: Southeast Asia.* Abu Dhabi: IRENA.

Islam, M.R. (2014). Non-Governmental Organizations' Role for Social Capital and Community Empowerment in Community Development: Experience from Bangladesh. *Asian Social Work and Policy Review.* 8 (3), pp. 261-274.

Jackson, C. (1996). Rescuing gender from the poverty trap. *World Development.* 24 (3), pp. 489-504.

Jackson, C. (1997). Gender, irrigation, and environment: Arguing for agency. In: *Gender Analysis and Reform of Irrigation Management: Concepts, Cases and Gaps in Knowledge. Proceedings of the Workshop on Gender and water.* 15-19th September. Habarana, Sri Lanka., 15-19th September. Colombo: International Water Management Institute.

Jackson, E.T., Draimin, T. and & Rosene, C. (1999). Civil society: a window on the future of partnership? *Civil Society.* 2 .

Jackson, T. (2009). *Prosperity without growth: Economics for a finite planet.* London: Routledge.

Jahan, R. (1996). The Elusive Agenda: Mainstreaming Women in Development. *The Pakistan Development Review.* 35 (4), pp. 825-834.

Jain, K. (2016). An Analytical Study on Human Rights in the State of Rajasthan: Special Reference to the Rules of Human Rights applied on the Women, Tribals and Dalits. *Splint International Journal of Professionals.* 3 (7), pp. 74.

Janardhan, N. (1995). Lessons from a women's development project: Do poor women have a choice? *Asia Pacific Development Journal.* 2 (2), pp. 37-50.

Jandhyala, K. (2003). *Empowering education: the Mahila Samakhya experience. Background paper for Education for all Global Monitoring Report.* 4. Paris: UNESCO.

Jangir, H. and Azeez, A. (2017). Parental attitudes and children's perception on gender discrimination: Evidences from rural Rajasthan. *Indian Journal of Sustainable Development*. 3 (1), pp.29-36.

Jaquette, J. (1982). Review of Women's Role in Economic Development. by Ester Boserup; Women in the Twentieth Century World. by Elise Boulding; Capitalist Patriarchy and the Case for Socialist Feminism. by Zillah H. Eisenstein; The Domestication of Women: Discrimination in Developing Societies. by Barbara Rogers. *World Politics.* 34 (No 2), pp. 267-284.

Jaquette, J.S. (1990). Gender and justice in economic development. In: Tinker, I. (ed.) *Persistent Inequalities*. Oxford: Oxford University Press.

Jaquette, J.S. (2017). Women/gender and development: the growing gap between theory and practice. *Studies in Comparative International Development*. 52 (2), pp. 242-260.

Jayaratne, T.E. (1983). The value of quantitative methodology for feminist research. In: Bowles, G. et al. (ed.) *Theories of women's studies.* Boston: Routledge and Kegal Paul.

Jayaratne, T.E. and Stewart, A.J. (1991). Quantitative and qualitative methods in the social sciences. In: Fonow, M.M. and Cook, J.A. (eds.) *Beyond methodology: Feminist scholarship as lived research.* Bloomington: Indiana University Press.

Javadi, F.S., Rismanchi, B., Sarraf, M., Afshar, O., Saidur, R., Ping, H.W. and Rahim, N.A. (2013). Global policy of rural electrification. *Renewable and Sustainable Energy Reviews*, 19, pp. 402-416.

Jeffery, P. (2018). *Don't marry me to a plowman! Women's everyday lives in rural North India.* New York: Routledge.

Jejeebhoy, S.J. (2000). Women's autonomy in rural India: Its dimensions, determinants, and the influence of context. In: Presser, H. and Sen, G. (eds.) *Women's Empowerment and Demographic Process. Moving beyond Cairo.* Oxford: Oxford University Press.

Jensen, R.T. and Oster, E. (2009). The power of TV: Cable television and women's status in India. *The Quarterly Journal of Economics.* 124 (3), pp. 1057-1094.

Jha, R., Gaiha, R., Pandey, M.K. and Shankar, S. (2015). Determinants and Persistence of Benefits from the National Rural Employment Guarantee Scheme–Panel Data Analysis for Rajasthan, India. *The European Journal of Development Research*. 27 (2), pp. 308-329.

Jónasdóttir, A.G. (1988). On the concept of interest, women’s interests, and the limitations of interest theory. In: Jones, K.B. and Jónasdóttir, A. (eds.) *The political interests of gender. Developing Theory and Research with a Feminist Face.* London: Sage Publications.

other stakeholders. 1st edn. London: Commonwealth Secretariat.

Kabeer, N. (1994). *Reversed realities: Gender hierarchies in development thought.* first edn. London: Verso.

Kabeer, N. (1998). *'Money can't buy me love'? Re-evaluating gender, credit and empowerment in rural Bangladesh.* Discussion Paper. Brighton: Institute of Development Studies.

Kabeer, N. (1999a). Resources, agency, achievements: Reflections on the measurement of women's empowerment. *Development and change.* 30 (3), pp. 435-464.

Kabeer, N. (1999b). *The conditions and consequences of choice: reflections on the measurement of women's empowerment.* 108. Geneva: UNRISD.

Kabeer, N. (2000a). *The power to choose. Bangladeshi women and Labour Market. Decisions in London and Dhaka.* London: Verso.

Kabeer, N. (2000b). Social exclusion, poverty and discrimination towards an analytical framework. *IDS bulletin.* 31 (4), pp. 83-97.

Kabeer, N. (2001). Reflections on the measurement of women's empowerment. In: Sisask, A. (ed.) *Discussing women's empowerment: Theory and Practice.* vol. 3. 3rd edn. Stockholm: Swedish International Development Agency.

Kabeer, N. (2003). *Gender Mainstreaming in Poverty Eradication and the Millennium Development Goals: A handbook for policy-makers and*

Kabeer, N. (2005). Gender equality and women's empowerment: A critical analysis of the third millennium development goal 1. *Gender & Development.* 13 (1), pp. 13-24.

Kabeer, N. and Huq, L. (2010). The power of relationships: Love and solidarity in a landless women's organisation in rural Bangladesh. *IDS Bulletin.* 41 (2), pp. 79-87.

Kabeer, N. (2012). *Women's economic empowerment and inclusive growth: labour markets and enterprise development.* London: International Development Research Centre.

Kabeer, N. (2017). Economic pathways to women's empowerment and active citizenship: what does the evidence from Bangladesh tell us?. *The Journal of Development Studies*. 53 (5), pp.649-663.

Kakani, M. (2014). *The women barefoot solar cooker engineers (WBSCE) booklet.* Tilonia: Barefoot College.

Kalpagam, U., 2019. *Neoliberalism and Women in India: Governmentality Perspectives*. Lanham: Rowman & Littlefield.

Kamboj, S., Malik, J.S., Kumar, P. and Khan, M. (2018). Constraints Perceived by Self-help Groups and Assessing Their Impact on Promotion of Entrepreneurial Skills in Mewat District of Haryana. *Asian Journal of Agricultural Extension, Economics & Sociology*. 25 (3), pp.1-7.

Kamen, P. (1991). *Feminist fatale: Voices from the "twentysomething" generation explore the future of the "Women's Movement".* first edn. New York: Donald I. Fine, Inc.

Kandiyoti, D. (1988). Bargaining with patriarchy. *Gender & Society.* 2 (3), pp. 274-290.

Kandiyoti, D. (2004). Identity and its Discontents: Women and the nation. *Women Living Under Muslim Law.* 26 (DOSSIER), pp. 45-58.

Kantor, P. (2003). Women's empowerment through home–based work: Evidence from India. *Development and change.* 34 (3), pp. 425-445.

Karlekar, M. (2004). A note on the empowerment of women. *Indian Journal of Gender Studies.* 11 (2), pp. 145-155.

Karlsson, G. (2007). *Where Energy is a Women Business: National and Regional from Africa, Asia, Latin America and the Pacific.* Leusden: ENERGIA.

Kaushik, A. (2015). Ending exclusion of women for economic growth in Rajasthan: A feminist approach. *Journal of Governance & Public Policy.* 5 (1), pp. 67.

Kelkar, G. (2009). *Climate change and vulnerability of indigenous women. Adivasi Women Engaging With Climate Change.* New Delhi: UNIFEM South Asia Office.

Khamati-Njenga, B. and Clancy, J. (2005). *Concepts and issues in gender and energy.* Leusden: ENERGIA.

Khan, H.J. (2001). Battery-operated lamps produced by rural women. *ENERGIA News.* 4 (3).

Khan, M.U.H. (1972). *Purdah and polygamy: A study in the social pathology of the Muslim society.* Peshawar: Cantt.

Khan, S.R. and Ansari, N. (2018). *A Microcredit Alternative in South Asia: Akhuwat's Experiment*. London: Routledge.

Khandelwal, M., Hill Jr, M.E., Greenough, P., Anthony, J., Quill, M., Linderman, M. and Udaykumar, H.S. (2017). Why have improved cook-stove initiatives in India failed?. *World Development*. 92, pp.13-27.

Kilby, P. (2004). Accountability for empowerment: Dilemmas facing non-governmental organizations. *World Development.* 34 (6), pp. 951-963.

Kilby, P. (2011). *NGOs in India. The challenges of women's empowerment and accountability.* London: Routledge Contemporary South Asia Series.

Kirby, A. (2004). Domestic protest: The ecovillage movement as a space of resistance. Issue. 65, January. *Bad subjects*.

Kirby, M. (1999). Gender and inequality. In: Kirby, M. (ed.) *Stratification and Differentiation.* Switzerland: Springer Nature.

Kishor, S. (2000). Empowerment of women in Egypt and links to the survival and health of their infants. In: Presser, H. and Sen, G. (eds.) *Women's Empowerment and Demographic Processes: Moving Beyond Cairo.* Oxford University Press.

Kitzinger, J. (1994). The methodology of focus groups: the importance of interaction between research participants. *Sociology of health & illness.* 16 (1), pp. 103-121.

Köhlin, G., Sills, E.O., Pattanayak, S.K. and Wilfong, C. (2011). *Energy, gender and development: what are the linkages? Where is the evidence?* Background Paper to the 2012 World Development Report-Policy Research Working Paper 5800. Washington D.C.: The World Bank.

Kooijman-van Dijk, A.L., 2009. *The Power to Produce: The role of energy in poverty reduction through small scale Enterprises in the Indian Himalayas*, University of Twente.

Kooijman-van Dijk, A.L. and Clancy, J. (2010). Impacts of electricity access to rural enterprises in Bolivia, Tanzania and Vietnam. *Energy for Sustainable Development.* 14 (1), pp. 14-21.

Kooijman, A., Cloke, J. and Clancy, J. (2018). *Needs, wants and alues: integrating gender with energy access. Briefing Paper 3.* Loughborough: Low Carbon Energy for Development Network, Loughborough University.

Kothari, R. (1987). Voluntary organisations in a plural society. *Indian Journal of Public Administration.* 33 (3), pp. 433-453.

Kulkarni, S., O'Reilly, K. and Bhat, S. (2017). No relief: lived experiences of inadequate sanitation access of poor urban women in India. *Gender & Development.* 25 (2), pp. 167-183.

Kumar, R. (1993). *The history of doing: An illustrated account of movements for women's rights and feminism in India 1800-1990.* New Delhi: Kali for Women.

Kumar, P., Rao, R.K. and Reddy, N.H., (2016). Sustained uptake of LPG as cleaner cooking fuel in rural India: role of affordability, accessibility, and awareness. *World Development Perspectives*, 4, pp. 33-37.

Kumari, S., Kaushik, V. and Lodha, N. (2010). Problems faced by rural women entrepreneurs of Rajasthan. *Studies on Home and Community Science.* 4 (2), pp. 115-119.

Ladusingh, L. (2016). Invisible Burden of Women. *Social Science Spectrum.* 2 (1), pp. 1-7.

Laxmi, V., Parikh, J., Karmakar, S. and Dabrase, P. (2003). Household energy, women's hardship and health impacts in rural Rajasthan, India: need for sustainable energy solutions. *Energy for sustainable development.* 7 (1), pp. 50-68.

Leach, F. and Sitaram, S. (2002). Microfinance and women's empowerment: A lesson from India. *Development in Practice.* 12 (5), pp. 575-588.

Leach, M. (2007). Earth mother myths and other ecofeminist fables: How a strategic notion rose and fell. *Development and change.* 38 (1), pp. 67-85.

Leckenby, D. and Hesse-Biber, S. (2007). Feminist approaches to mixed-methods research. In: Hesse-Biber, S. and Leavy P. (eds.) *Feminist research practice: A primer.* Thousand Oaks: Sage Publications.

Lee, R.M. and Fielding, N.G. (1991). Computing for qualitative research: Options, problems and potential. In: Lee, R.M. and Fielding, N.G. (eds.) *Using computers in qualitative research.* London: Sage.

Lincoln, Y.S. and Denzin, N.K. (2003). *Turning points in qualitative research: Tying knots in a handkerchief.* Walnut Creek: Rowman Altamira.

Lingam, L. (2007). Domains of Empowerment: Women in Micro-Credit Groups Negotiating with Multiple Patriarchies. In: Elliott, C.M. (ed.) *Global Empowerment of Women: Responses to Globalization and Politicized Religions.* London: Routledge. pp. 119-140.

Litfin, K.T. (2014). *Ecovillages: Lessons for sustainable community.* Cambridge: Polity Press.

Luttrell, C., Quiroz, S., Scrutton, C. and Bird, K. (2007). *Understanding and operationalising empowerment. A framework for an understanding of empowerment within SDC.* London: Overseas Development Institute and Swiss Agency for Development Cooperation.

MacKenzie, M.A. (1991). *Androgynous objects: string bags and gender in central New Guinea.* Chur: Harwood Academic Publisher.

Maher, F.A. (1987). Inquiry Teaching and Feminist Pedagogy. *Social education.* 51 (3), pp. 186-188.

Malhotra, A. and Schuler, S.R. (2005). Women's empowerment as a variable in international development. In: Narayan-Parker, D. (ed.) *Measuring empowerment: Cross-disciplinary perspectives.* Washington, DC: World Bank.

Malhotra, P., Neudoerffer, R.C. and Dutta, S. (2004). A participatory process for designing cooking energy programmes with women. *Biomass and Bioenergy.* 26 (2), pp. 147-169.

Malhotra, A., Schuler, S.R. and Boender, C. (2002). Measuring women's empowerment as a variable in international development . In: Narayan-Parker, D. (ed.) *Measuring empowerment: Cross-disciplinary perspectives.* Washington, DC: The World Bank.

March, C., Smyth, I.A. and Mukhopadhyay, M. (1999). *A guide to gender-analysis frameworks.* London: Oxfam.

Marshall, C. and Rossman, G.B. (2014). *Designing qualitative research.* 6th edn. New York: Sage publications.

Masera, O.R., Díaz, R. and Berrueta, V. (2005). From cookstoves to cooking systems: the integrated program on sustainable household energy use in Mexico. *Energy for Sustainable Development.* 9 (1), pp. 25-36.

Masud, J., Sharan, D. and Lohani, B.N. (2007). *Energy for all: addressing the energy, environment, and poverty nexus in Asia.* April. Philippines: Asian Development Bank.

Mathee, A. and de Wet, T. (2001). Rural Electrification in South Africa: Implications for the Health and the Quality of Life of Women. *ENERGIA News.* 4 (4), pp. 1-23.

Mathur, K. (2004). *Countering gender violence: Initiatives towards collective action in Rajasthan.* New Delhi: Sage Publications.

Matinga, M.N., 2010. *We Grow Up With It: An Ethnographic Study of the Experiences, Perceptions and Responses to the Health Impacts of Energy Acquisition and Use in Rural South Africa*, University of Twente.

Meadows, K., Riley, C., Rao, G. and Harris, P. (2003). *A literature review into the linkages between modern energy and micro-enterprise.* 33. London: Department for International Development.

Mehta, C., Chandel, N., Senthilkumar, T. and Singh, K.K. (2014). *Trends of agricultural mechanization in India.* 2-Policy Brief. Bangkok: Economic and Social Commission for Asia and the Pacific (ESCAP).

Meikle, S. (2004). *A Study of the Impact of Energy Use on Poor Urban Women and Girls' Livelihoods in Arusha, Tanzania.* London: University College London.

Merriam, S.B. (2002). Introduction to qualitative research. *Qualitative research in practice: Examples for discussion and analysis.* 1 (1), pp. 1-17.

Merriam-Webster (2019). *Panchayat.* Available from: https://www.merriam-webster.com/dictionary/panchayat. [Accessed: April, 2019].

Mies, M. (1982). *The lace makers of Narsapur: Indian housewives produce for the world market.* London: Zed Books.

Miles, M.B. and Huberman, A.M. (1994). *An expanded sourcebook qualitative data analysis*. Thousands Oaks: SAGE.

Miller, J. and Durndell, A. (2004). Gender, language and computer-mediated communication. In: Brebbia, C.A. and Voiskounsky, A. (eds.) *Human Perspectives in the Internet Society: Culture, Psycology and Gender.* vol. 31. Southampton: WIT Press.

Millner, A. and Dietz, S. (2015). Adaptation to climate change and economic growth in developing countries. *Environment and Development Economics.* 20 (3), pp. 380-406.

Mitra, A. (2014). Son preference in India: Implications for gender development. *Journal of Economic Issues.* 48 (4), pp. 1021-1037.

Mohanty, C.T. et al. (ed.) (1991). *Third world women and the politics of feminism.* Bloomington and Indianapolis: Indiana University Press.

Mohideen (2012). *The implications of clean and renewable energy development for gender equality in poor communities in South Asia.* Technology and Society in Asia (T&SA), 2012 IEEE Conference on. 1stedn. Melbourne, Australia: IEEE.

Mohideen, R. (2013). Clean, Renewable Energy: Improving Womens' Lives in South Asia. *IEEE Technology and Society Magazine.* 32 (3), pp. 48-55.

Molyneux, M. (1985). Mobilization without emancipation? Women's interests, the state, and revolution in Nicaragua. *Feminist studies.* 11 (2), pp. 227-254.

Momsen, J. (2008). *Women and development in the third world.* 2nd edn. London: Routledge.

Momsen, J.H. (2001). Backlash: or how to snatch failure from the jaws of success in gender and development. *Progress in development studies.* 1 (1), pp. 51-56.

Momsen, J.H. (2004). *Gender and development.* first edn. London and New York: Psychology Press.

Momsen, J.H. (2010). *Gender and Development.* 2nd edn. London: Routledge.

Montgomery, R., Bhattacharya, D. and Hulme, D. (1996). Credit for the poor in Bangladesh. The BRAC rural development programme and the government Thana resource development and employment programme. In: Hulme, D. and Mosley, P. (eds.) *Finance against poverty.* London: Routledge.

Moodie, M. (2008). Enter microcredit: A new culture of women's empowerment in Rajasthan? *American Ethnologist.* 35 (3), pp. 454-465.

Mosedale, S. (2003). Towards a framework for assessing empowerment. In: *New Directions in Impact Assessment for Development: Methods and Practice.* 24-25th November. 24-25th November. Manchester: University of Manchester, pp. 1-25.

Moser, C. and Levy, C. (1986). *A theory and methodology of gender planning: meeting women's practical and strategic needs.* London: DPU, University College London.

Moser, C. (1989). Gender planning in the Third World: meeting practical and strategic gender needs. *World Development.* 17 (11), pp. 1799-1825.

Moser, C. (1993). *Gender planning and development: Theory, practice and training.* first edn. London and New York: Routledge.

Moser, C. (2003). *Gender planning and development: Theory, practice and training.* London, New York: Routledge.

Moser, C. (2005). *An introduction to gender audit methodology: Its design and implementation in DFID Malawi.* London: Overseas Development Institute.

Murthy, P. (2015). Culture and alcohol use in India. *World Cult Psychiatry Res Rev*. 10, pp.27-39.

Musante, K. and DeWalt, B.R. (2010). *Participant observation: A guide for fieldworkers.* 2nd edn. Plymouth: Rowman Altamira.

Nagar, R. and Raju, S. (2003). Women, NGOs and the contradictions of empowerment and disempowerment: A conversation. *Antipode.* 35 (1), pp. 1-13.

Naples, N.A. (2003). *Feminism and method: Ethnography, discourse analysis, and activist research.* New York: Routledge.

Narayan, D. (2005). Conceptual framework and methodological challenges. In: Narayan, D. (ed.) *Measuring empowerment. Cross-disciplinary perspectves.* Washington D.C.: World Bank.

Nath, V. (2001). Empowerment and governance through information and communication technologies: Women's perspective. *The International Information & Library Review.* 33 (4), pp. 317-339.

Nayek, S. and Padhy, P.K., (2017). Daily personal exposure of women cooks to respirable particulate matters during cooking with solid bio-fuels in a rural community of West Bengal, India. *Aerosol Air Qual Res*. 17 (1), pp. 245-252.

Nussbaum, M. (2000). Women's capabilities and social justice. *Journal of Human Development.* 1 (2), pp. 219-247.

O'Reilly, K. (2006). "Traditional" women,"modern" water: Linking gender and commodification in Rajasthan, India. *Geoforum.* 37 (6), pp. 958-972.

O'Reilly, K. (2012). *Ethnographic methods.* 2nd edn. London: Routledge.

O'Shaughnessy, S., Deasy, M., Kinsella, C., Doyle, J. and Robinson, A. (2013). Small scale electricity generation from a portable biomass cookstove: prototype design and preliminary results. *Applied Energy.* 102, pp. 374-385.

Oakley, A. (1981). Interviewing women: A contradiction in terms. In: Roberts, H. (ed.) *Doing feminist research.* 1st edn. London: Routledge.

Oparaocha, S. and Dutta, S. (2011). Gender and energy for sustainable development. *Current Opinion in Environmental Sustainability.* 3 (4), pp. 265-271.

Pachauri, S., Mueller, A., Kemmler, A. and Spreng, D. (2004). On measuring energy poverty in Indian households. *World Development.* 32 (12), pp. 2083-2104.

Pachauri, S. (2011). Reaching an international consensus on defining modern energy access. *Current Opinion in Environmental Sustainability.* 3 (4), pp. 235-240.

Palsson, G., Szerszynski, B., Sörlin, S., Marks, J., Avril, B., Crumley, C., Hackmann, H., Holm, P., Ingram, J. and Kirman, A. (2013). Reconceptualizing the 'Anthropos' in the Anthropocene: Integrating the social sciences and humanities in global environmental change research. *Environmental Science & Policy.* 28, pp. 3-13.

Pande R. (2017). Some Issues and Challenges to Women's Development and Empowerment in India. *Feminist Research*. 1(1), pp. 23-30

Pandey, S., Singh, V.S., Gangwar, N.P., Vijayvergia, M.M., Prakash, C. and Pandey, D.N. (2012). Determinants of success for promoting solar energy in Rajasthan, India. *Renewable and Sustainable Energy Reviews.* 16 (6), pp. 3593-3598.

Panjwani, A. and Cecelski, E. (2003). *Major Activities and Actors in Energy, Poverty and Gender.* 34532. Washington D.C.: World Bank.

Pankaj, A. and Tankha, R. (2010). Empowerment effects of the NREGS on women workers: a study in four states. *Economic and Political Weekly.* 40 (30), pp. 45-55.

Parikh, J. (2000). *Rural energy and health impacts. Project prepared for the Ministry for Environment and Forest. Project Report No. 048.* Mumbai: Indira Gandhi Institute of Development and Research.

Parikh, J. and Laxmi, V. (2000). Biofuels, pollution and health linkages: a survey of rural Tamil Nadu. *Economic and political weekly.* 35 (47), pp. 4125-4137.

Parpart, J.L., Rai, S.M. and Staudt, K.A. (2003). *Rethinking empowerment: Gender and development in a global/local world.* London and New York: Routledge.

Participatory Research in Asia (PRIA) (1991). *Voluntary Development Organisations in India. A Study of History, Roles and future Challeneges.* New Delhi: Society for Participatory Research in Asia.

Patel, R. (2018). *Hindu women's property rights in rural India: law, labour and culture in action.* London: Routledge.

Patton, M.Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research.* 34 (5 Pt 2), pp. 1189-1208.

Pearse, R. (2017). Gender and climate change. *Wiley Interdisciplinary Reviews: Climate Change.* 8 (2), pp. 1-16.

Pinter, L., Almassy, D., Antonio, E., Niestroy, I., Olsen, S. and Pulawska, G. (2013). *Sustainable Development Goals and Indicators for a Small Planet-Interim Report.* Singapore: Asia-Europe Foundation (ASEF).

Pohekar, S., Kumar, D. and Ramachandran, M. (2005). Dissemination of cooking energy alternatives in India—a review. *Renewable and Sustainable Energy Reviews.* 9 (4), pp. 379-393.

Practical Action (2010). *Poor People's Energy Outlook 2010.* Rugby, UK: Practical Action.

Practical Action (2013). *Poor People's Outlook 2013. Energy for Community Services.* 1. Rugby: Practical Action Publishing Ltd.

Prebble, M. and Rojas, A. (2017). *Energysing equality: The importance of integrating gender equality principles in national energy policies and frameworks.* Washington D.C.: IUCN and USAID.

Punch, K.F. (2014). *Introduction to social research: Quantitative and qualitative approaches.* Los Angeles: Sage.

Radha, R. (2019). Historical perspective of violence against women in India through various ages. *International Journal of Basic and Applied Research*. 9 (6), pp.149-153.

Rahman, L. and Rao, V. (2004). The determinants of gender equity in India: examining Dyson and Moore's thesis with new data. *Population and Development Review.* 30 (2), pp. 239-268.

Rai, A. and Ravi, S. (2011). Do spouses make claims? Empowerment and microfinance in India. *World Development.* 39 (6), pp. 913-921.

Raj, A., Silverman, J.G., Klugman, J., Saggurti, N., Donta, B. and Shakya, H.B. (2018). Longitudinal analysis of the impact of economic empowerment on risk for intimate partner violence among married women in rural Maharashtra, India. *Social Science & Medicine*. 196, pp.197-203.

Rajasekhar, D. (2000). Non-Governmental Organisations (NGOs) in India: Opportunities and Challenges. *Journal of Rural Development.* 19 (2), pp. 249-275.

Ramani, K.V. and Heijndermans, E. (2003). *Energy, Poverty and Gender: a Synthesis,EnPoGen, Asia Alternatives in Energy Program.* April. Washington: The International Bank for Reconstruction and Development and the World Bank.

Rammohan, A. and Vu, P. (2018). Gender inequality in education and kinship norms in India. *Feminist Economics.* 24 (1), pp. 142-167.

Rao, N.D. and Baer, P. (2012). “Decent living” emissions: a conceptual framework. *Sustainability.* 4 (4), pp. 656-681.

Rao, N.D. (2013). Does (better) electricity supply increase household enterprise income in India? *Energy Policy.* 57, pp. 532-541.

Rao, N. (2017). Assets, agency and legitimacy: Towards a relational understanding of gender equality policy and practice. *World development*, 95, pp. 43-54.

Rathgeber, E.M. (1990a). WID, WAD, GAD: Trends in research and practice. *The Journal of Developing Areas.* 24 (4), pp. 489-502.

Rathgeber, E.M. (1990b). WID, WAD, GAD: Trends in research and practice. *The Journal of Developing Areas.* 24 (4), pp. 489-502.

Ravilla, T.D., Gupta, S., Ravindran, R.D., Vashist, P., Krishnan, T., Maraini, G., Chakravarthy, U. and Fletcher, A.E., (2016). Use of cooking fuels and cataract in a population-based study: the India eye disease study. *Environmental health perspectives*. 124 (12), pp.1857-1862.

Razavi, S., 1992. *Agrarian change and gender power:*
a comparative study in southeastern Iran, University of Oxford.

Razavi, S. and Miller, C. (1995). *From WID to GAD: Conceptual shifts in the women and development discourse.* vol. 1. Geneva: United Nations Research Institute for Social Development.

Reason, P., and Rowan, J. (1981). Issues of validity in new paradigm research. In: Reason, P., and Rowan, J., (eds), *Human inquiry: A sourcebook of new paradigm research*, pp 239-262. New York: John Wiley.

Reddy, A., Annecke, W., Blok, K., Bloom, D., Boardman, B., Eberhard, A. and Ramakrishna, J. (2000). *Energy and social issues.* In: World Energy Assessment: Energy and the Challenge of Sustainability. New York: United Nations Development Programme (UNDP).

Reddy, B.S. and Nathan, H.S.K. (2013). Energy in the development strategy of Indian households—the missing half. *Renewable and Sustainable Energy Reviews.* 18, pp. 203-210.

Reddy, B.S. (2015). Access to modern energy services: An economic and policy framework. *Renewable and Sustainable Energy Reviews.* 47, pp. 198-212.

Rehman, I.H., Kar, A., Raven, R., Singh, D., Tiwari, J., Jha, R., Sinha, P.K. and Mirza, A. (2010). Rural energy transitions in developing countries: a case of the Uttam Urja initiative in India. *Environmental Science & Policy.* 13 (4), pp. 303-311.

Rewald, R. (2017). *Energy and Women and Girls: Analyzing the needs, uses and impacts of energy on women and girls in the developing world.* Oxfam Research Backgrounder series. Boston: Oxfam.

Richardson, R., Schmitz, N., Harper, S. and Nandi, A. (2019). Development of a Tool to Measure Women's Agency in India. *Journal of Human Development and Capabilities*. 20 (1), pp.26-53.

Ritchie, J., Lewis, J., McNaughton N.C. and Ormston, R. (2013). *Qualitative research practice: A guide for social science students and researchers.* London: Sage.

Robert, F.C., Sisodia, G.S. and Gopalan, S. (2017). The critical role of anchor customers in rural microgrids: Impact of load factor on energy cost. In *2017 International Conference on Computation of Power, Energy Information and Commuincation (ICCPEIC)*, 22nd March, pp. 398-403. IEEE.

Robinson, M. (1998). Democracy, participation, and public policy: The politics of institutional design. In: Robinson, M. and White, G. (eds.) *The Democratic*

Developmental State:Politics and Institutional Design. Oxford: Oxford University Press.

Robinson, N. (1999). The use of focus group methodology—with selected examples from sexual health research. *Journal of advanced nursing.* 29 (4), pp. 905-913.

Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers.* Oxford: Blackwell.

Rocheleau, D., Thomas-Slayter, B. and Wangari, E. (1996). *Feminist Political Ecology: global issues and local experiences.* London: Routledge.

Roehr, U. (2001). Gender and Energy in the North, Background Paper for the International Conference. In: *Gender Perspectives for Earth Summit 2002: Energy, Transport, Information for Decision Making.* 10-12th January. Berlin. London: UNED.

Rojas, A.V., Schmitt, F.M. and Aguilar, F. (2012). *Guidelines on Renewable Energy Technologies for Women in Rural and Informal Urban Areas.* IUCN; ENERGIA.

Rosen, R. (2000). *The world split open: How the modern women's movement changed America.* New York: Viking.

Rowlands, J. (1997). *Questioning empowerment: Working with women in Honduras.* London: Oxfam.

Roy, B. (1995). Voluntary action: Where do we go from here. *Lokayan Bulletin.* 12 (3), pp. 31-39.

Roy, B. and Joshi, A. (2005). Solar Electrification of Remote and Inaccessible Villages: The Barefoot Approach. In: *Proceedings of the Asian Regional Workshop on Electricity and Development.* 28th-29th April. 28th-29th April. Pathumathani: Asian Institute of Technology: 28-29.

Roy, B. and Hartigan, J. (2008). Empowering the rural poor to develop themselves: The barefoot approach (Innovations case narrative: barefoot college of Tilonia). *Innovations.* 3 (2), pp. 67-93.

Roy, B. (2011). United Nations Commission on the Status of Women Fifthy-fifth session-Key policy initiatives and capacity-building on gender mainstreaming focus on science and technology. In: *Women Barefoot Solar Engineers a community solution.* 22nd February-4th March. 22nd February-4th March. New York: UN.

Roy, S. (2015). Empowering women? Inheritance rights, female education and dowry payments in India. *Journal of Development Economics.* 114, pp. 233-251.

Rustagi, P. (2010). *Employment Trends for Women in India.* ILO Asia-Pacific Working Paper Series. New Delhi: International Labour Organisation.

Sachs, W. (1992). *Development Dictionary, The: A Guide to Knowledge as Power.* London: Zed Books.

Sadik, N. (1986). Integration of women in population and development programmes. *Asia-Pacific population journal.* 1 (3), pp. 3.

Saha, A. (2019). Rural Employment Generation in India: A Critical View from Rajasthan. *South Asia Research*. 39 (1), pp. 23-42.

Sahoo, S.K., Varma, P., Lall, K.P. and Talwar, C.K. (2016). Energy efficiency in India: Achievements, challenges and legality. *Energy Policy.* 88, pp. 495-503.

Saigal, G. and Sarawat, K. (2013). Women's Empowerment in India. *ANVESHAK-International Journal of Management.* 2 (2), pp. 210-223.

Sangari, K. (1995). Politics of diversity: Religious communities and multiple patriarchies. *Economic and Political Weekly.* 30 (55), pp. 3287-3310.

Santos, F.M. (2012). A positive theory of social entrepreneurship. *Journal of Business Ethics.* 111 (3), pp. 335-351.

Sarachild (1970). *A program for feminist consciousness-raising.* Notes From the Second Year: Women's Liberation; Major Writings of the Radical Feminist. New York: Radical Feminism.

Sarin, M. (1984). *Nada Chula: a Handbook.* 1st edn. New Delhi: Voluntary Health Association of India.

Schensul, J., LeCompte, M., Trotter, R., Cromley, E. and Singer, M. (1999). *Ethnographer's toolkit.* Walnut Creek, CA: AltaMira Press.

Schroeder, R.A. (1999). *Shady practices: Agroforestry and gender politics in the Gambia.* Berkley: University of California Press.

Schuler, M. (1986). *Women empowerment and the law: Strategies of third world women.* Washington D.C.: OEF International.

Schultz, T.P. (2001). Women's roles in the agricultural household: Bargaining and human capital investments. *Handbook of agricultural economics.* 1, pp. 383-456.

Sen, A. (1987). *Gender and cooperative conflicts.* Helsinki: World Institute for Development Economics Research.

Sen, A. (1993). Capability and well-being. In: Nussbaum, M. and Sen, A. (eds.) *The Quality of Life.* first edn. Oxford: Oxford Scholarship Online, Oxford University Press.

Sen, A. (1995). Gender Inequality and Theories of Justice. In: Nussbaum M, and Glover, J. (eds.) *Women, Culture, and Development: A Study of Human Capabilities: A Study of Human Capabilities.* Oxford: Clarendon Press.

Sen, A. (1999). *Development as freedom.* vol. 525. 1st edn. New York: Alfred A. Knopf.

Sen, A. (2000). A decade of human development. *Journal of human development.* 1 (1), pp. 17-23.

Sen, A. (2001). The many faces of gender inequality. *Frontline.* 19th November (18), pp. 4-14.

Sen, G. and Grown, C. (1987). *Development Crises and Alternative Visions Third World Women's Perspectives.* London and New York: Routledge.

Sen, G. (1997). *Empowerment as an Approach to Poverty.* Background Paper to Human Development Report. New York: UNDP.

Sen, G. and Batliwala, S. (2000). Empowering women for reproductive rights. In: Presser, H.B. and Sen, G. (eds.) *Women's empowerment and demographic*

processes: moving beyond Cairo. first edn. Oxford: Oxford England Oxford University Press 2000.

Sen, S. (1992). Non-profit organisations in India: historical development and common patterns. *Voluntas: International Journal of Voluntary and Nonprofit Organizations.* 3 (2), pp. 175-193.

Sen, S. (1999). Some aspects of state–NGO relationships in India in the post-independence era. *Development and Change.* 30 (2), pp. 327-355.

Sharma, A. (2016). Gender Inequality and Women Empowerment. In: Nayak, S. (ed.). *Whither Women: A Shift from Endowment to Empowerment*. New Delhi: Edupedia Publications LTD.

Sharma, A. and Bornstein, E. (2016). The righteous and the rightful: The technomoral politics of NGOs, social movements, and the state in India. *American Ethnologist*. 43 (1), pp. 76-90.

Sharma, P. and Badodiya, S. (2016). Impact of participation of rural women in agriculture activities. *Indian Research Journal of Extension Education.* 16 (2), pp. 12-14.

Sharma, D., Ravindra, K., Kaur, M., Prinja, S. and Mor, S. (2019). Cost evaluation of different household fuels and identification of the barriers for the choice of clean cooking fuels in India. *Sustainable Cities and Society*, 52, pp.101825.

Sharp, J., Briggs, J., Yacoub, H. and Hamed, N. (2003). Doing gender and development: understanding empowerment and local gender relations. *Transactions of the Institute of British Geographers.* 28 (3), pp. 281-295.

Sheth, D. and Sethi, H. (1991). The NGO sector in India: historical context and current discourse. *Voluntas: International Journal of Voluntary and Nonprofit Organizations.* 2 (2), pp. 49-68.

Shining Hope Foundation (2014). *Barefoot College illiterate grandmothers trained as solar engineers.* vol. https://www.youtube.com/watch?v=5xyueW3pk0Q. London: Shining Hope Fundation.

Singh, P. and Kumud, D. (2013). Gender disparities among districts of Rajasthan. *International Journal of Innovative Research in Science, Engineering and Technology.* 2 (10), pp. 5330-5332.

Singh, R.K.P., Singh, K.M. and Kumar, A. (2014). *A study on adoption of modern agricultural technologies at farm level in Bihar.* Paper No. 73831. Munich: Munich Personal RePEc Archive (MPRA).

Sivaramakrishnan, K. and Agrawal, A. (2003). *Regional modernities: The cultural politics of development in India.* Stanford: Stanford University Press.

Skutsch, M.M. (1998). The gender issue in energy project planning Welfare, empowerment or efficiency? *Energy Policy.* 26 (12), pp. 945-955.

Skutsch, M.M. (2005). Gender analysis for energy projects and programmes. *Energy for Sustainable Development.* 9 (1), pp. 37-52.

Smith, L.C. (2003). The importance of women's status for child nutrition in developing countries: International Food Policy Research Insitute (IFPRI). Research Report Abstract 131. *Food and Nutrition Bulletin.* 24 (3), pp. 287-288.

Sörlin, S. (2012). Environmental humanities: why should biologists interested in the environment take the humanities seriously? *Bioscience.* 62 (9), pp. 788-789.

Sovacool, B.K. and Drupady, I.M. (2016). *Energy access, poverty, and development: the governance of small-scale renewable energy in developing Asia*. London: Routledge.

Sowards, S.K. and Renegar, V.R. (2004). The rhetorical functions of consciousness-raising in third wave feminism. *Communication Studies.* 55 (4), pp. 535-552.

Spary, C. (2019). *Gender, development and the state in India.* London: Routledge.

Spradley, J.P. (2016). *Participant observation.* Long Grove: Waveland Press.

Srinivasan, B. (2007). In the Crucible: When development, poverty and fundamentalism combine. *Development.* 50 (2), pp. 122-126.

Srivastava, L. and Rehman, I.H. (2006). Energy for sustainable development in India: Linkages and strategic direction. *Energy Policy.* 34 (5), pp. 643-654.

Srivastava, N. and Srivastava, R. (2010). Women, work, and employment outcomes in rural India. *Economic and political weekly.* 45 (28), pp. 49-63.

Stake, R.E. (1995). *The art of case study research.* Thousand Oaks: Sage.

Standal, K., 2008. *Giving light and hope in rural Afghanistan: the impact of Norwegian Church Aid's barefoot approach on women beneficiaries*, University of Oslo.

Standal, K. (2016). The Globalizing Effect of Solar Energy Access on Family and Gender Relations in Rural India. *Asia in Focus.* (Special Issue), pp. 14-22.

Standal, K. and Winther, T. (2016). Empowerment through energy? Impact of electricity on care work practices and gender relations. In: *Forum for Development Studies.* 43. Taylor & Francis, pp. 27-45.

Stanley, L. and Wise, S. (1983). *Breaking out: Feminist consciousness and feminist research.* Boston: Routledge.

Stromquist, N.P. (1999). The theoretical and practical bases for empowerment. In: Rao, D.B. and Rao D.P. (eds.) *Women, education, and empowerment: Pathways towards autonomy.* New Delhi: Discovery Publishing House.

Stromquist, N.P. (2015). Women's Empowerment and Education: linking knowledge to transformative action. *European Journal of Education.* 50 (3), pp. 307-324.

Swidler, A. (1995). Cultural power and social movements. In: Johnston, H. and Klandermans, B. (eds.) *Social Movements and Culture: Protests and Contention.* Minneapolis: University of Minnesota Press.

Tandon, S.L. and Sharma, R. (2006). Female Foeticide and Infanticide in India: An Analysis of Crimes against Girl Children. *International journal of criminal justice sciences.* 1 (1) .

Temple, B. and Young, A. (2004). Qualitative research and translation dilemmas. *Qualitative research*, 4 (2), pp.161-178.

Terry, G. (2009). No climate justice without gender justice: an overview of the issues. *Gender & Development.* 17 (1), pp. 5-18.

The Energy and Resource Institute (TERI) (2014). *Secretary-General's Special Representative for Sustainable Energy for All (SE4ALL) announces that the first two years of the SE4ALL Decade will focus on women, energy and health.* Available from: http://www.teriin.org/press-release/secretary-generals-special-representative-sustainable-energy-all-se4all-announces.

Therien, J. (1999). Beyond the North-South divide: the two tales of world poverty. *Third World Quarterly.* 20 (4), pp. 723-742.

Thomas, A., Chataway, J. and Wuyts, M. (1998). *Finding out fast: investigative skills for policy and development.* London: Sage.

Tinker, I. (1990). *Persistent inequalities: women and world development.* Oxford: Oxford University Press.

Torri, M.C. (2010). Power, structure, gender relations and community-based conservation: The Cawswe Study of the Sariska Region, Rajasthan, India. *Journal of International Women's Studies.* 11 (4), pp. 1-18.

Udayakumar, S., 2016. *Socio-Economic Sustainability of Rural Energy Access in India*, KTH Industrial Engineering and Management.

ul Haq, M. (2002). *Human Development in South Asia 2001: Globalisation and Human Development.* Oxford: Oxford University Press.

Ulsrud, K. (2015). *Village-level solar power in practice: Transfer of socio-technical innovations between India and Kenya*. PhD. Thesis, University of Oslo, Norway. Available from: http://urn.nb.no/URN:NBN:no-52241. [Accessed: April 2019].

UN Energy (2005). *The Energy Challenge for Achieving the Millennium Development Goals.* New York: UN Habitat.

United Nations Environmental Programme (2011). Towards a Green Economy: Pathways to Sustainable Development and Poverty. A Synthesis for Policy Makers. New York: UNEP. Available from: www.unep.org/greeneconomy. [Accessed: April 2019].

UN Women (2018). *Turning promises into action: gender equality in the 2030 agenda for sustainable development.* New York: UN.

United Nations (1995). *Beijing Platform for Action.* Annexe 1, para 7. New York: United Nations.

United Nations (2011). *Sustainable Energy for All - A Vision Statement by Ban Ki-moon Secretary-General of the United Nations.* Newyork: UN.

United Nations (2012). *The Future We Want. Resolution adopted by the General Assembly on 27 July 2012.* New York: UN.

United Nations (2015). *Sustainable Development Goals.* Available from: http://in.one.un.org/page/sustainable-development-goals/. [Accessed: April 2019].

United Nations (2018). *World Economic Situation and Prospects.* New York: UN.

United Nations Development Programme (2004). *Gender and Energy for Sustainable Development: A Toolkit and Resource Guide.* December. New York: UNDP.

United Nations Development Programme (2012). *Mobile Technologies and Empowerment: Enhancing Human Development through Participation and Innovation.* New York: UNDP.

United Nations Development Programme (2015). *Human Development Report. Work for Human Development.* New York: UN.

United Nations Framework Convention on Climate Change (2015). *Paris Agreement.* Available from: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement. [Accessed: April 2019].

University of Cape Town and Innovation for Poverty Action (2019). *Female microenterprise creation and business models for private sector distribution of low-cost off-grid LED lighting: Multiple Randomized Experiments .* RA5-University of Cape Town; IPA. The Hague: ENERGIA.

University of Oslo, TERI, Seacrester Consulting and Dunamai Energy (2019). *Women's empowerment and electricity access: How do grid and off-grid systems enhance or restrict gender equality?* Research report RA1, ENERGIA.

Unterhalter, E. (2005). Global inequality, capabilities, social justice: The millennium development goal for gender equality in education. *International Journal of Educational Development.* 25 (2), pp. 111-122.

Van Nes, F., Abma, T., Jonsson, H. and Deeg, D. (2010). Language differences in qualitative research: is meaning lost in translation?. *European journal of ageing*, 7 (4), pp.313-316.

Walters, S. and Manicom, L. (1996). *Gender in Popular Education. Methods for Empowerment.* 2nd edn. London and New Jersey: CACE and Zed Books.

Wamukonya, N. and Skutsch, M. (2001). CoP-6: The Gender Issue Forgotten. *Energia News.* 4 (1), pp. 14.

Weaver, A. and Atkinson, P. (1995). From coding to hypertext: strategies for microcomputing and qualitative data analysis. In: Burgess, R.G. (ed.) *Studies in qualitative methodology.* vol. 5. Greenwich CT: JAI Press.

Weitbrecht, M. (1875). *The Women of India: And Christian Work in the Zenana.* London: J. Nisbet and Co.

Westmarland, N. (2001). The quantitative/qualitative debate and feminist research: a subjective view of objectivity. *Forum: qualitative social research.* 2 (1).

Whitehead, A. (1984). *Im hungry mum: the politics of domestic budgeting.* London: Routledge.

Wides, L. (1998). *Gender lessons from community-based PV Projects in rural Guatemalan villages.* The Hagues: ENERGIA.

Wieringa, S. (1994). Women's interests and empowerment: gender planning reconsidered. *Development and Change.* 25 (4), pp. 829-848.

Wiggins, N. (2011a). Critical pedagogy and popular education: towards a unity of theory and practice. *Studies in the Education of Adults.* 43 (1), pp. 34-49.

Wiggins, N. (2011b). Popular education for health promotion and community empowerment: a review of the literature. *Health Promotion International.* 27 (3), pp. 356-371.

Wilkinson, S. (1998). Focus groups in feminist research: Power, interaction, and the co-construction of meaning. *Women's studies international forum.* 21 (1), pp. 111-125.

Wilkinson, S. and Silverman, D. (2004). Focus Group Research. In: Silverman, D. (ed.) *Qualitative Research: Theory, Method and Practice.* 2nd edn. London: Sage.

Wilkinson-Weber, C.M. (1999). *Embroidering lives: women's work and skill in the Lucknow embroidery industry.* SUNY Press.

Williams (2005). *Measuring gender and women's empowerment using confirmatory factor analysis.* Boulder: University of Colorado.

Winther, T. (2008). *The impact of electricity: Development, desires and dilemmas.* New York: Berghahn Books.

Winther, T., Matinga, M.N., Ulsrud, K. and Standal, K. (2017). Women's empowerment through electricity access: scoping study and proposal for a framework of analysis. *Journal of Development Effectiveness.* 9 (3), pp. 389-417.

Winther, T., Ulsrud, K. and Saini, A. (2018). Solar powered electricity access: Implications for women's empowerment in rural Kenya. *Energy Research & Social Science.* 44 (October), pp. 61-74.

WomenAction (2000). *Report of on-line Discussion on Women and Media.* Section J-Beijing Platform for Action -November 8th-December 17th, 1999. Online Network: WomenAction.

World Bank (1989). *Women in development: Issues for economic and sector analysis.* WID Division Working Paper No. 269. Washington, D.C.: World Bank.

World Bank (2007). *Gender Equality as Smart Economics: A World Bank Group Action Plan*. Washington DC: World Bank.

World Bank (2008) World Bank Press release 'Adolescent girls'. Available from: http://siteresources.worldbank.org/INTECAREGTOPGENDER/Resources/AdolescentGirls08PressRelease1.pdf. [Accessed: April 2019].

World Bank (2012). *World Development Report- Gender and Development.* Washington D.C.: World Bank.

World Bank (2014). *World development Report.* Washington D.C.: WB.

World Health Organisation (2006). *Fuel for Life: Household Energy and Health.* Geneva: World Health Organisation.

World Health Organisation (2008). China village doctors take great strides. *Bulletin of the World Health Organization.* 86 (12), pp. 909-988.

Yenneti, K. (2013). The Sun Shines on India-A Review of the Implementation and Financial Continuum of the National Solar Mission. *Renewable Energy L.& Pol'y Rev.* 4 (2013), pp. 280-291.

Yenneti, K. and Day, R. (2015). Procedural (in) justice in the implementation of solar energy: the case of Charanaka solar park, Gujarat, India. *Energy Policy.* 86 (2015), pp. 664-673.

Yin, R.K. (1994). *Case Study Research- Design and Methods. Applied Social Science Research Series. Vol. 5.* 2nd edn. London: SAGE.

Yin, R.K. (2003). *Case Study Research: Design and Methods.* London: SAGE.

Yin, R.K. (2011). *Applications of case study research.* 3rd edn. London: SAGE.

Yin, R.K. (2015). *Qualitative research from start to finish.* Guilford: Guilford Publications.

Young, I.M. (1997). *Intersecting voices: Dilemmas of gender, political philosophy, and policy.* Princeton: Princeton University Press.

Young, K. (1988). *Gender and development: A relational approach, in Gender Analysis for Management of Research in Agriculture and Natural Resources.* The Hague: International Service for Natural Agriculture Research.

Young, K. (1993). *Planning development with women: making a world of difference.* first edn. London: Macmillan Press Ltd.

Appendix A

Interview topic guide: solar engineers

Study Title: "Can energy empower women? A case study of the Solar Mamas' programme in rural Rajasthan, India".

The questions for the interview will focus on:

Energy-related questions:

Access to, availability and use of energy sources.

Kinds of energy sources available.

Access, use and benefits of solar energy.

Involvement in the solar programme:

Motivation and engagement process in joining the training.

Implications of the solar programme for the participants and local communities

Perception of empowerment.

Changes in women's life after the training:

Education

Participation in decision making

Self-esteem/confidence:

Well-being

Safety and security

Time management

Participation in women's groups/networks

Equality

Autonomy and mobility (ability/freedom of choice-freedom of movement)

Learning new skills

Employment/employability

Appendix B

Interview topic guide: professionals of the Barefoot College

Study Title: “Can energy empower women? A case study of the Solar Mamas’ programme in rural Rajasthan, India”.

The questions for the interview will include:

The history, motivations and aims of the Solar Mamas’ programme developed by your organisation.
How do you select the villages where the solar engineers install the solar panels?
How do you select and engage participants?
Why only women are included?
What do the women do after the training?
How many women have been trained, so far?
What are the outcomes of the programme for local women and communities?
What opportunities and barriers are there for the promotion of women’s empowerment and gender equality?
How do you think the programme contributes to the empowerment of the participants?
How do you feel participating in the training benefits participants in terms of:

- Learning new skills
- Participating in the community activities and decision-making
- Income generation opportunities/employment
- Self-esteem
- Autonomy

How does, if any, the programme contribute the sustainable development of local communities?
What are the gaps to the programme that you have identified?
Is there anything you would like to change/improve about the training programme and the solar programme as a whole?

Appendix C

Ethic Review Panel Approval Letter

Keele University

Ref: ERP2256

15th July 2015

Giulia M Mininni
School of Politics, International Relations and Philosophy (SPIRE)
Claus Moser Building, Room 1.10
Keele University
Keele
ST5 5BG

Dear Giulia

Re: Can energy enpower women? A case study in Rajasthan

Thank you for submitting your revised application for review.

I am pleased to inform you that your application has been approved by the Ethics Review Panel.

Yours sincerely

pp C H Bonnerman

Dr Colin Rigby
Vice Chair – Ethical Review Panel

CC RI Manager
Supervisor